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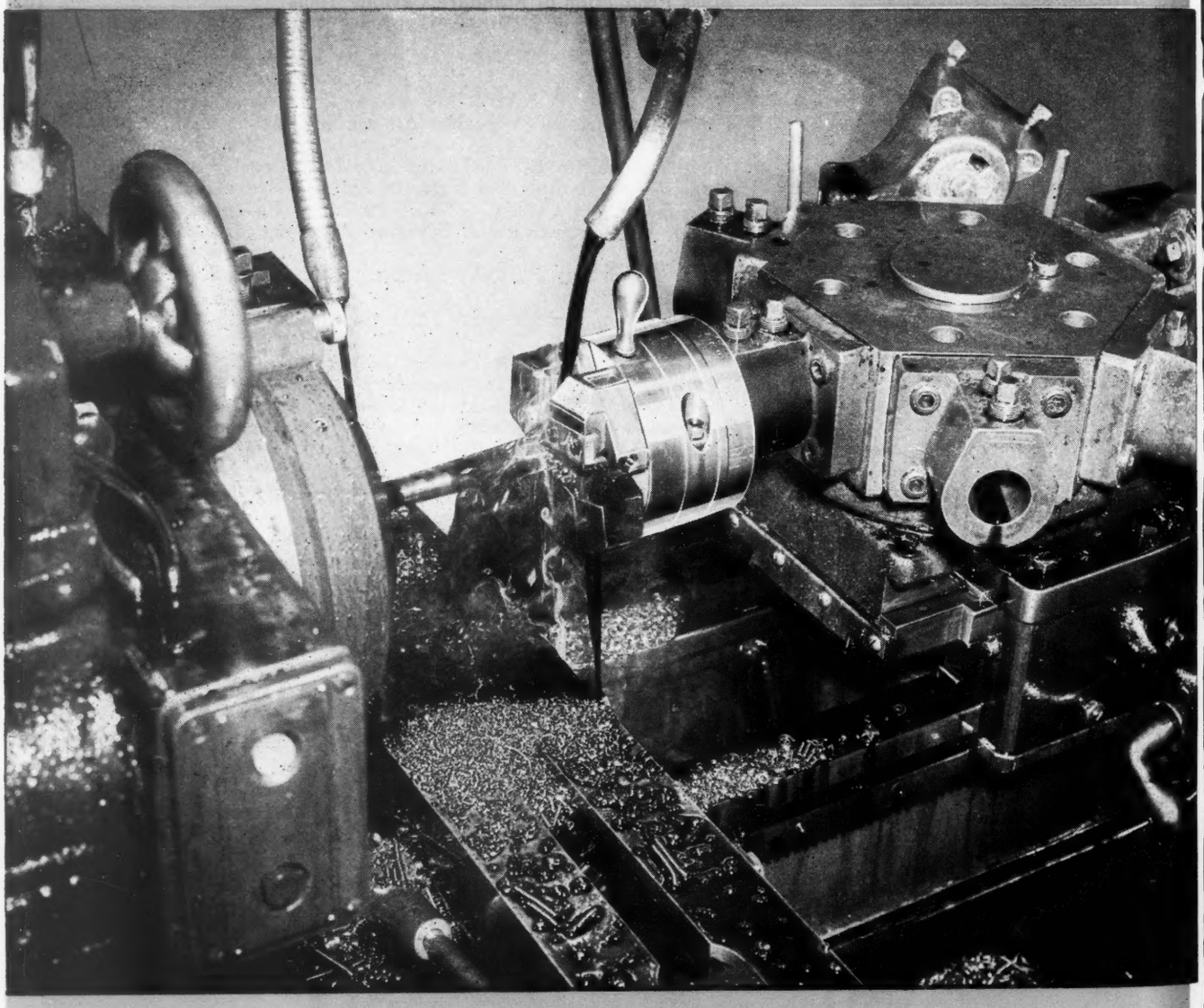

. . . . . THE WORLD'S LARGEST EXCLUSIVE

By LORING F. OVERMAN

Recent Efforts to Ease the Problems of the Machine Tool Industry

THE machine tool industry, considered by many in Washington as the beloved but somewhat misunderstood problem child of the defense program, is currently attracting intended-to-be-helpful attention from several angles. Among these are the following:

1. An effort to channel machine tools into the most essential spots is being made through a further amended NPA Order M-41.
2. The new Machine Tool Commission has been asked to give particular attention to long-range welfare of the industry.
3. A new NPA Order M-104 seeks to expedite deliveries by limiting the types of finish applied to machine tools.
4. Revised ceiling prices for used machine tools are included in a new OPS price book.

PATTERNED after WPB Order E-1-b, which was in effect during World War II, the principal accomplishment of amended Order M-41 is to provide a system of distributing among seven Service Agencies the 70 per cent of production reserved for their use. Earlier versions of M-41 provided for an allocation of monthly deliveries to Service claimants. No provision was made, however, for determining the relative essentiality of claimant agencies' orders. Under the new order, machine tool builders are to establish their own order boards, arranging deliveries in accordance with urgency numbers on a master numerical preference list classified as "restricted" for security reasons.

Another important change in Order M-41 is an increase from $350 to $1000 in the value of machines moving in the free market, not subject to the restrictions of the Machine Tool Order.

AT press time for this column, Acting Defense Mobilizer John R. Steelman was about to establish the Machine Tool Commission plan which remained as unfinished business when Charles E. Wilson left the top spot in the defense program. The Commission, made up of officials from industry and the Government procurement agencies, was to be assigned a long-range analysis of the machine tool field. Among other things, the Commission hoped to answer such questions as how to maintain the machine tool industry on a healthy basis, avoiding some of the peaks and depressions that have previously taken place in wartime and post-war periods; how to select and maintain stockpiles of machine tools; and how to make plans that will shorten delivery time in the current emergency.

ONE suggestion for speeding deliveries of machines—simplification of finishes permitted or required—was written into the law of the defense program with the issuance of Order M-104 on April 9. The limitation order provides that "In the finishing of any new metal-working machine, or any part assembly to be incorporated into such a tool, producers shall not apply a primer, sealer, filler, paint, lacquer, or enamel in excess of the following limitations: (1) Not more than one coat of primer or sealer; (2) no filler except for the spot filling of bad cavities or fissures; and (3) not more than two coats of paint, lacquer, or enamel."

IF the military had its way, the builders of machine tools would not have to wonder about false starts or canceled contracts. The military aircraft program would be given a green light quickly, and the screws would be put on civilian economy all the way down to gasoline rationing. Such, at least, is the viewpoint of General Carl Spaatz, former Air Force commander, who considers the "stretch out" of the aircraft program "an inexcusable and dangerous risk." Speaking before the Senate Armed Services Preparedness Committee, General Spaatz made some startling observations. He explained that the initial target for aircraft production was to be 1800 planes a month by the fall of 1953, but that under the stretch-out policy, the total would be 1250 per month. However, House-approved cuts in the defense appropriations might reduce the total to 1050, he indicated.

Until the present emergency is definitely over, it appears quite unlikely that the producers of metal-working equipment will be without new and sizable assignments. One of the great problems of the defense program is the fact that the scientific mind can dream up new wonders faster than the drawing boards, forges, and lathes can produce the finished product.

ANOTHER of the uncertainties of the defense program is the pricing level, with OPS officials constantly puzzled by unanticipated results of their efforts to "protect purchasers from selfish producers and harried producers from each other."

The latest effort along this line is a new OPS price book with revised price ceilings for used machine tools. Ceilings will be based on the price levels of new tools in effect on December 15, 1951. The former base period was January 25, 1951—the date the freeze on prices and wages first took effect.

The new base date has been decided upon because records of new machine tool prices are much more easily obtained for the December period. However, since the December prices for new machines were higher than during the original base period, figures are to be revised so as to produce approximately the same ceiling prices for used machines as are provided under CPR80. That ceiling price regulation provides a method for determining ceilings on used machine tools on the basis of a specified percentage of the current new ceiling for the same machine.

Industry Advisory Committee members, for instance, complained to OPS that some members of the industry have worked out a system of charging higher prices by combining their sales and servicing of machines under CPR80 and CPR34, the latter being a services regulation. OPS explained that it is not illegal for an operator under CPR80 to charge for repair services under CPR34, but that it is illegal to require the purchasers to accept services offered under CPR34 as a condition to the sale of a machine tool under CPR80.

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MACHINERY
JUNE 1952

A Solid Foundation for Defense

WHENEVER the nation finds it necessary to gird itself for war or possible war, the state of the machine tool industry becomes of paramount importance. If the industry happens to be in a prosperous situation maintaining shops well staffed with competent workers, and if it is operating on a sound financial basis, the machine tools required for producing the sinews of war can be turned out with dispatch.

On the other hand, if the industry is in the doldrums of a depression, serious delays are unavoidable in getting the required machine tools to the production front. Such a situation could conceivably jeopardize the safety of our nation on some future occasion.

With a view to promoting a greater measure of stability for the machine tool industry, and consequently its ready adaptability to national emergencies, Frederick S. Blackall, Jr., president of the National Machine Tool Builders' Association, has outlined a program for the Association that has eight objectives. The first objective of this program would be a modification of the federal tax laws to permit rapid and complete recovery of capital invested in industrial plants and equipment. Such a step would provide a stimulus toward keeping metal-working plants equipped with modern machinery and would tend to iron out swings of "boom and bust" which contribute to periodic depressions of the machine tool industry. Another important objective would be a change in the regulations that cover the renegotiation of earnings, so that the machine tool industry would not find itself prostrated financially by the period of depression which follows every era of arming for national defense.

Mr. Blackall suggests that the Government maintain a permanent reserve stock of modern machine tools in the same manner as it now keeps tanks, guns, and small arms in reserve for the hour of need. He also feels that a uniform procurement policy should be adopted for all agencies of the Government with respect to machine tools—a program that would eliminate costly delays in ordering vital equipment when an emergency suddenly occurs. A complete stand-by pool order should also be adopted and checked annually so that the machine tool industry could swing into immediate production for defense. Provisions should be made for the financing or advance payment of pool orders.

Mr. Blackall feels that steps should be taken to safeguard the industry from serious dangers of foreign competition which could result from governmental policies. Another recommendation is the development of a long-range public relations program, aimed at impressing the Government and its citizens with the fact that a healthy machine tool industry is essential to the maintenance of a strong nation. Finally, a permanent machine tool commission is advocated to foster cooperation between the Government and the industry.

Such a program would definitely provide a sound foundation for our national economy, not only in time of war but also in time of peace.

Charles O. Herb

EDITOR

Tool Steel from Ryerson

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Steel procurement is trouble enough these days without adding unnecessary steps. That's one reason why more and more metal working shops are ordering tool steel from Ryerson, their regular warehouse steel source. This way, one call often does the work of two. One order, one invoice covers tool steel *and* other requirements.

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Courtesy of Heppenstall Co., Pittsburgh, Pa.

High-Speed Trepanning with Carbide-Tipped Tools

Production of Gun Barrels, Housings, Marine Propeller Shafts, and Similar Large-Diameter, Long Parts Can be Greatly Accelerated by Means of High-Speed Trepan-Boring with Carbide-Tipped Tools. Rates of Penetration as High as 43½ Feet per Hour have been Obtained – First of Two Articles

VARIOUS forms of trepanning and trepan-boring with high-speed steel tools have been employed on an extensive scale over a period of nearly forty years by Walter Somers, Ltd., of Halesowen, near Birmingham, England. During this time, much valuable experience has been gained, and the firm has come to be regarded as specialists in trepanning techniques. This experience, applied more recently to developments in high-speed trepan-boring with carbide-tipped tools, has led to the achievement of some remarkable performances that will here be described.

An example of the firm's trepan-boring practice, employing high-speed steel tools, is illustrated in Figs. 1 and 2, and is representative of the methods regularly used. The work is set up in the centrally located, hollow headstock spindle

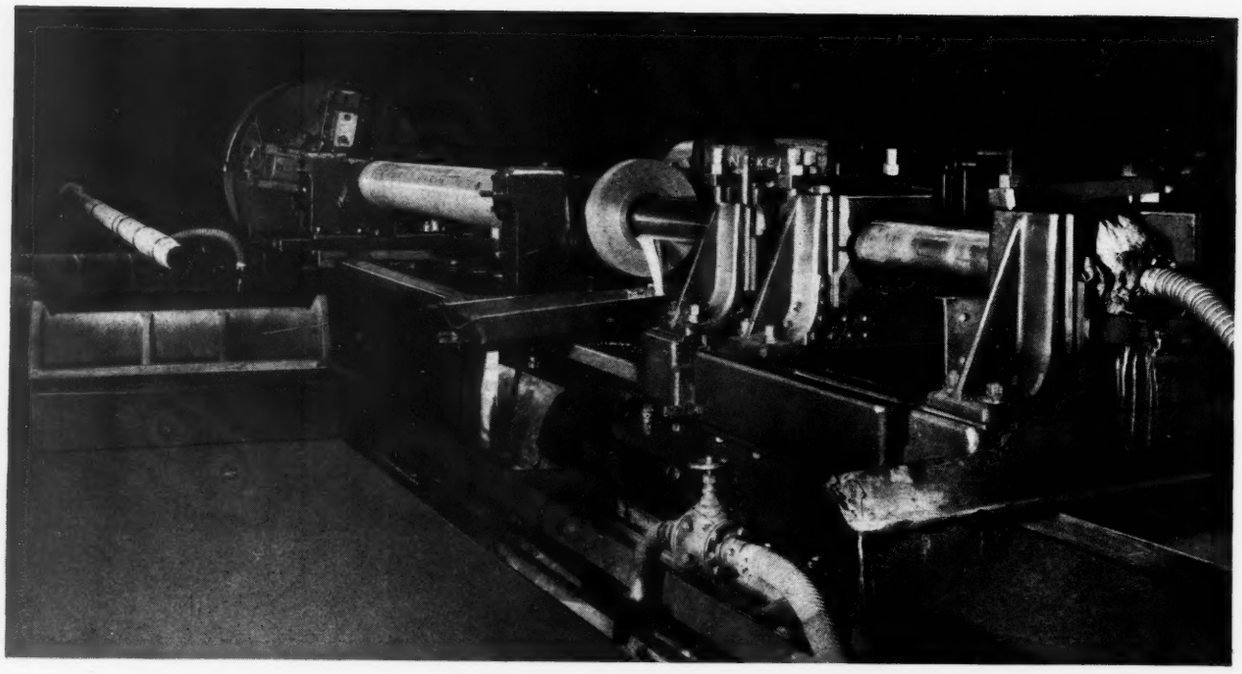


Fig. 1. A core-bar of useful material – seen at the left – is obtained in trepanning the 32-foot long marine propeller shaft shown mounted in the double-end shaft-boring lathe.

of a conventional double-end shaft-boring lathe, boring-bars of a tubular type being employed. Two, three, or four high-speed steel tools are mounted in the forward edge of a hollow head on each bar, and are fed into the rotating work, which is supported in roller type steadyrests. Using both heads simultaneously at opposite ends, or one head from one end, annular cuts are taken, leaving a core-bar of useful material.

The width of the tools is greater than the wall thickness of the bar to provide the necessary clearance for removal of the coolant and chips. Coolant is pumped into the interior of the bar, passes through the cutting zone, and escapes, carrying the chips with it, through the space between the work-bore and the outside of the bar. This method, which offers several advantages over drilling or solid boring, has been carried out successfully on lengths up to 80 feet.

In the set-up seen in Fig. 1, forged steel marine, intermediate propeller shafts 32 feet long were bored to a diameter of 8 1/2 inches. In one typical instance, the bore was machined in fifty-five hours, using two trepanning heads, each fitted with four high-speed steel tools and four gun-metal steady-pads. The width of cut was 1 15/16 inches, and the diameter of the core-bar obtained was 4 5/8 inches. A work speed of 10 R.P.M. was employed, which gave a maximum peripheral cutting speed of 22 feet per minute, the feed being approximately 0.006 inch per revolution. The rate of penetration was 3 1/2 inches an hour at each end, and there was no measurable eccentricity in the completed bore. After boring each depth of approximately 5 feet, the tools were reground and on completion of the work were still in good condition, while the surfaces of the core and bore were smooth, with only slight feed-marks.

Another example gives an indication of the performance obtainable in boring by this method to the present maximum depth. The work-piece —another propeller shaft—is shown in Fig. 3. As will be seen from the illustration, the main bore is 9 5/8 inches in diameter by 72 feet long, while the smaller diameter bore is 8 feet 7 inches long. This smaller bore necessitated trepanning the entire length of the main bore from one end only, and a four-tool head similar to those employed in the preceding example was used. The work was rotated at 10 R.P.M., giving a maximum peripheral cutting speed of 25 feet per minute, and the feed of approximately 0.006 inch per revolution gave a penetration rate of 3 1/2 inches per hour. The main bore was completed in 247 hours.

The first set of tools and gun-metal guides was replaced by a fresh set after a depth of approximately 40 feet had been reached, and all were reground after each depth of approximately 5 feet was bored. As a result of successive regrinding, the width of the cut, which at the start was 1 15/16 inches, was reduced to 1 13/16 inches at the finish. Similarly, the bore diameter at the

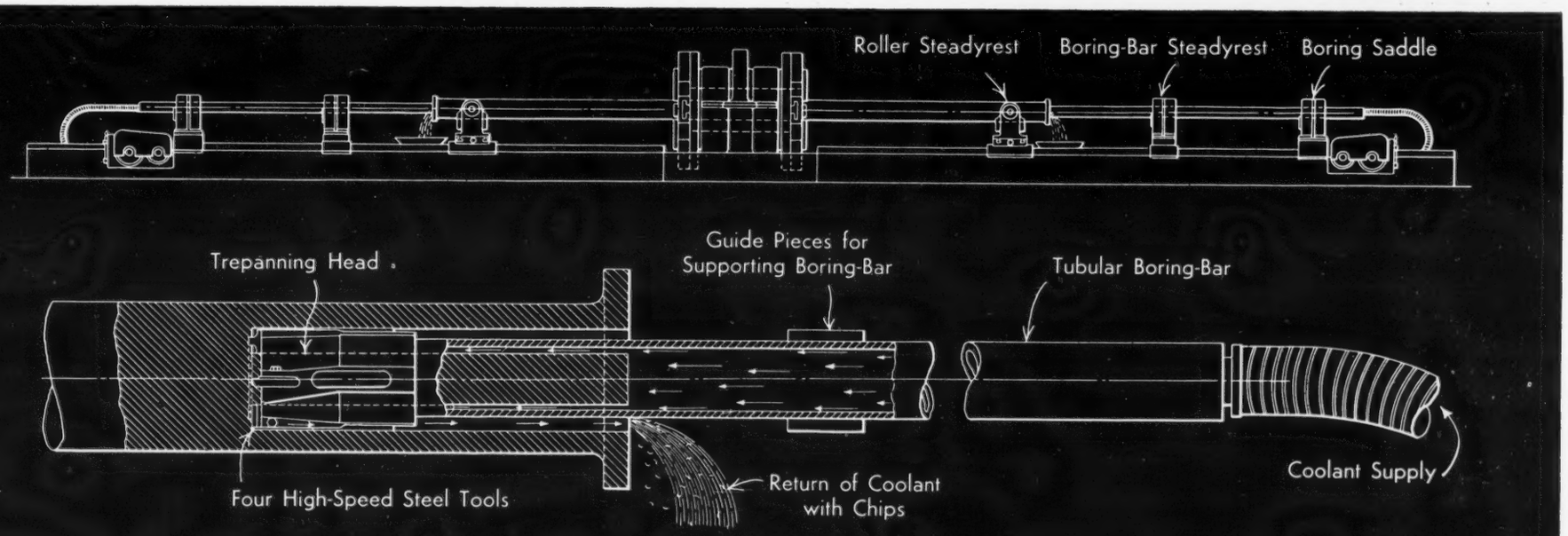


Fig. 2. (Above) Set-up on a double-end, shaft-boring lathe for trepan-boring a shaft, 32 feet long, simultaneously from both ends. (Below) Diagram showing arrangement of trepanning head and coolant flow for removal of chips

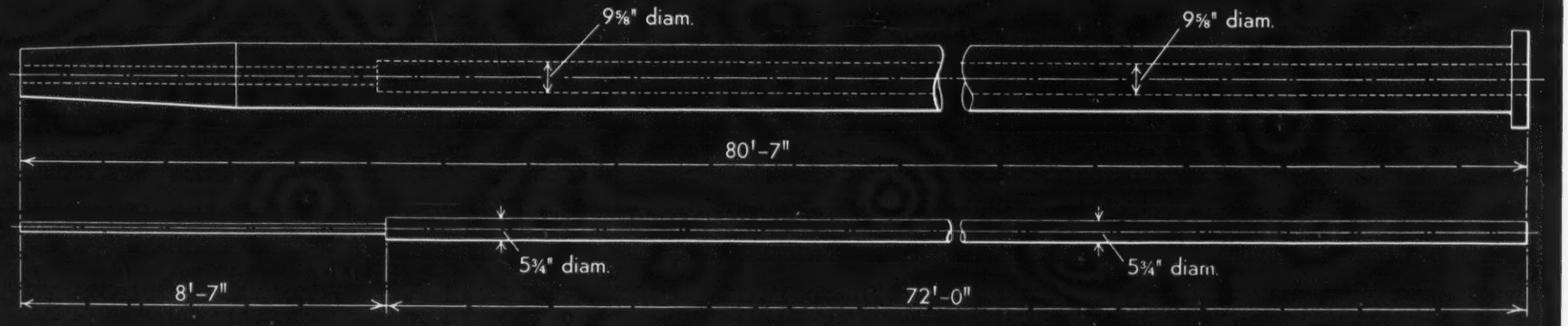


Fig. 3. A forged steel propeller shaft (above), and the core-bar (below) removed from the forging after trepan-boring to a depth of 72 feet

start was 9 5/8 inches, and at the finish 9 1/2 inches, while the initial core diameter of 5 3/4 inches was increased to 5 7/8 inches. The surface finish of the bore and core was good, but after the first 50 feet, both became slightly noncircular. In this instance, the eccentricity, which was 0.312 inch, was the worst so far experienced, but subsequently ranged from 0.093 to 0.187 inch over lengths up to 64 feet.

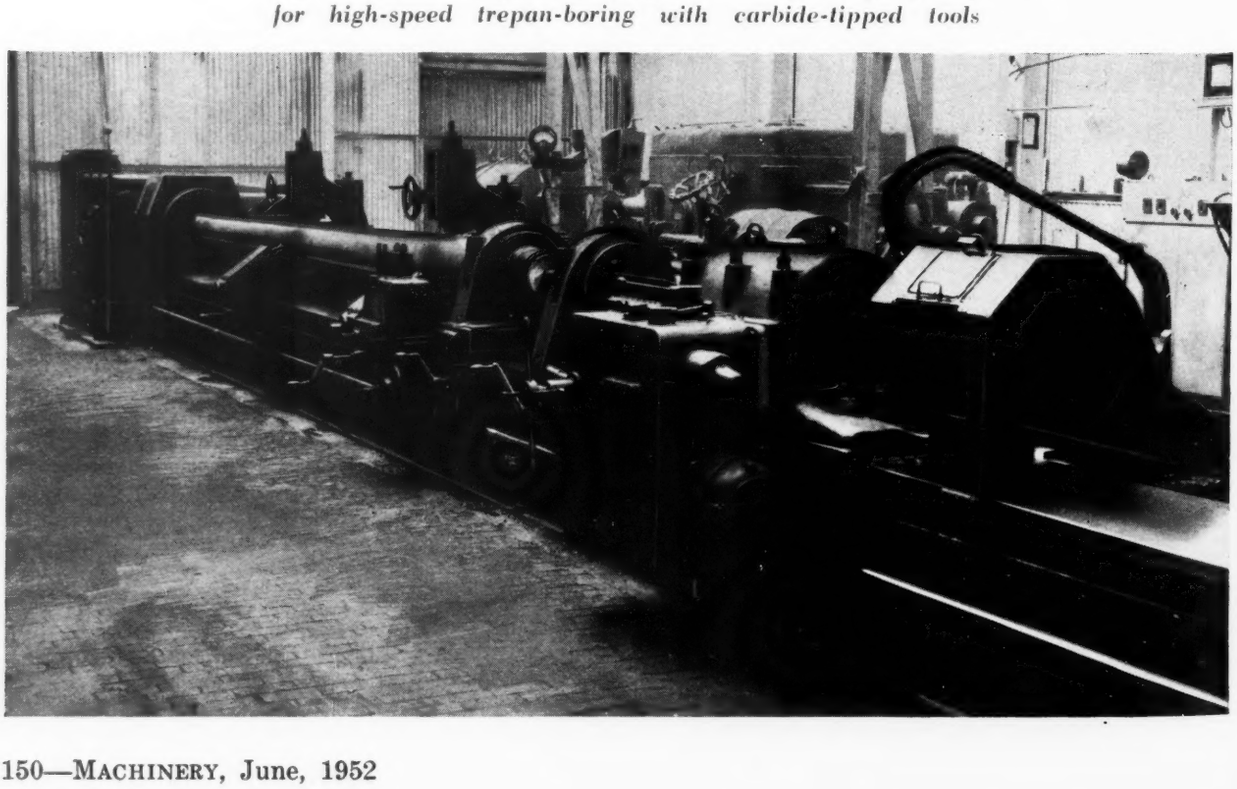
In view of the firm's long experience with trepan-boring, it was a logical development to undertake a program of investigation into the possibilities of high-speed, deep-hole, trepan-boring with carbide-tipped tools. Accordingly, a large number of experiments were carried out. It was evident, at an early stage, that existing boring lathes, which were designed for use with high-speed steel tools, were not suitable for adaptation to operation with tungsten-carbide tools. Most of the existing available machines, while adequate for working with high-speed steel tools, were found to be insufficiently rigid, had not the necessary high spindle speeds, and did not permit sufficiently flexible speed control.

To meet the requirements of high-speed trepan-boring, the company acquired from Germany a Schiess single-end boring lathe designed specifically for use with carbide tools, shown in Fig. 4. The Heppenstall Co., Pittsburgh, Pa., has acquired manufacturing rights for lathes of this type, and is now undertaking the work of converting existing types of machines for high-speed trepan-boring.

The Schiess lathe has several outstanding features. In addition to being extremely rigid, it is designed to insure that the transmission of vibration from the driving-gears to the work is minimized. The drive is transmitted from a 68-H.P. main motor through a flexible coupling. Keyed to the motor spindle, one portion of the coupling is in the form of a brake-drum, around which is fitted a band-brake operated electro-hydraulically. Another portion, keyed to the gear-shaft, consists of a metal hub carrying a molded rubber body, the outer edge of which is encircled by an angle-section steel ring. The two portions are connected by twelve bolts. The final drive to the spindle is through twenty-two V-belts, and the motor and gear-box are mounted on a common baseplate which can be adjusted transversely for regulating the belt tension. Thus, by virtue of the considerable force exerted by the combined tension of this large number of belts, the spindle is pre-loaded in one direction, and running backlash and vibration are thereby reduced.

The gear-box is arranged to give eighteen speed changes, in geometric progression, from 22 to 850 R.P.M. At the forward end of the spindle is mounted an attachment termed a "lantern fixture," which is, in effect, a removable, hollow extension. The sides of the fixture, Fig. 5, are cut away to give access to the trepanning head. These apertures are of such a size that, when a bore has been completed, the tool can be conveniently removed from the head, thus avoid-

Fig. 4. German single-end boring lathe designed specifically for high-speed trepan-boring with carbide-tipped tools



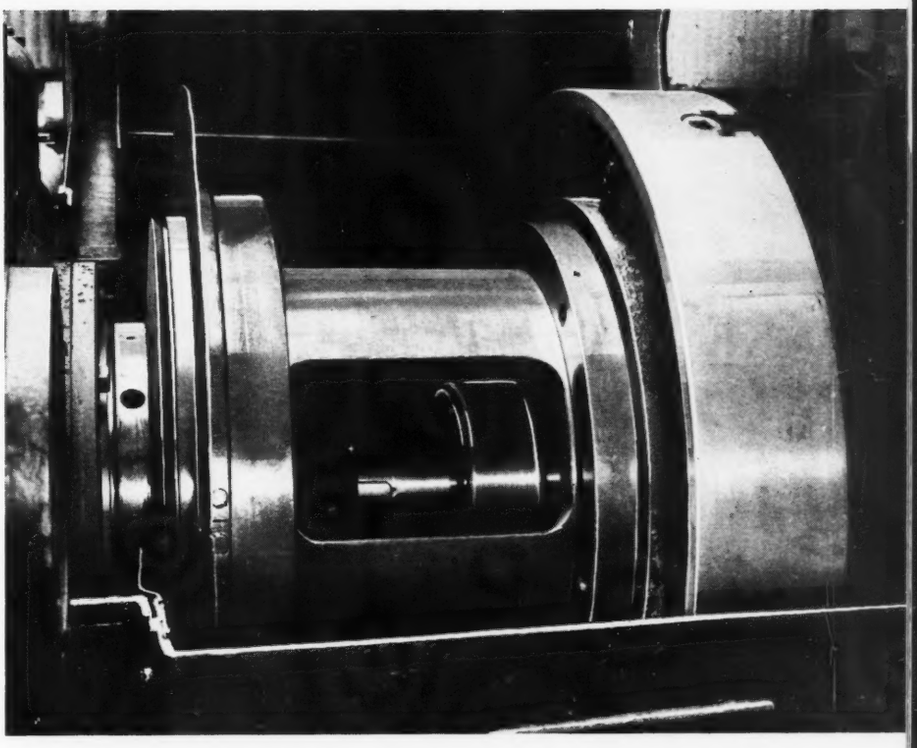


Fig. 5. Lantern fixture on the lathe seen in Fig. 4 facilitates removal of the trepanning tool prior to withdrawal of the bar from the bore

ing the need for withdrawing it through the work-bore with consequent risk of scoring or marking. The chuck is mounted directly on the forward end of the lantern fixture.

For driving the feed-shaft, which extends the full length of the bed, a gear wheel is keyed to the rear end of the headstock spindle, and from this gear, power is transmitted through a stepless variable-speed unit. The boring-bar saddle is equipped with an apron that houses the feed change-gears, and these gears afford six overlapping groups of reversible feeds. The over-all range of these groups is from 0.002 to 0.555 inch per revolution at spindle speeds not exceeding 600 R.P.M. At higher speeds, the feed range is from 0.0014 to 0.400 inch per revolution.

The boring-bar saddle can be arranged for quick power traverse in both directions, at a rate of 9 feet per minute, by means of a separate motor, or it can be hand-traversed. In order to enable boring-bars of various diameters to be accommodated, the bar-holder is bored to receive adapter bushings which are rigidly clamped by a bolted cap.

In addition to the bar saddle, there is a compound tool-rest saddle drive from the same feed-shaft. The range of feeds for this saddle is 0.0057 to 0.026 inch per revolution for speeds not exceeding 600 R.P.M., and 0.0035 to 0.017 inch per revolution for higher speeds. Two work steadyrests are provided, and each can be traversed along the bed by means of a hand-lever and rack and pinion. Each steadyrest has two bottom rollers which can be adjusted simultaneously for moving the work-piece vertically, and a third roller which can be swung aside on its supporting arm.

In the working position, the arm is positively locked, but the arm can be unlocked to swing it aside by operating a handwheel. The roller is carried on a vertical slide which provides for adjustment, and a firm, even pressure of all three rollers is insured by the fact that the top roller is loaded by a strong compression spring. All the rollers are mounted on cylindrical roller bearings.

The two boring-bar steadyrests are provided with hand-operated traverse motions, and can be secured at any desired position along the bed by means of locking screws. The steadyrests are of the cap type, and they are bored to receive adapter bushings for different bar diameters.

For work of this type, a large volume of coolant is required, and a tank of 350 gallons capacity is therefore provided. As the delivery point for the coolant may move with the bar feed, or may require frequent repositioning for work-pieces of different lengths, excessive lengths of feed-pipes are avoided by the use of a mobile pump unit.

For this reason, the coolant tank is in the form of a long trough arranged parallel with and at the rear of the bed, while the pump unit and driving motor are mounted on a wheeled carriage, as shown in Fig. 6. Guided by rails that run the full length of the bed, the carriage can thus be moved for delivering the coolant to any required point. The original coolant pump,

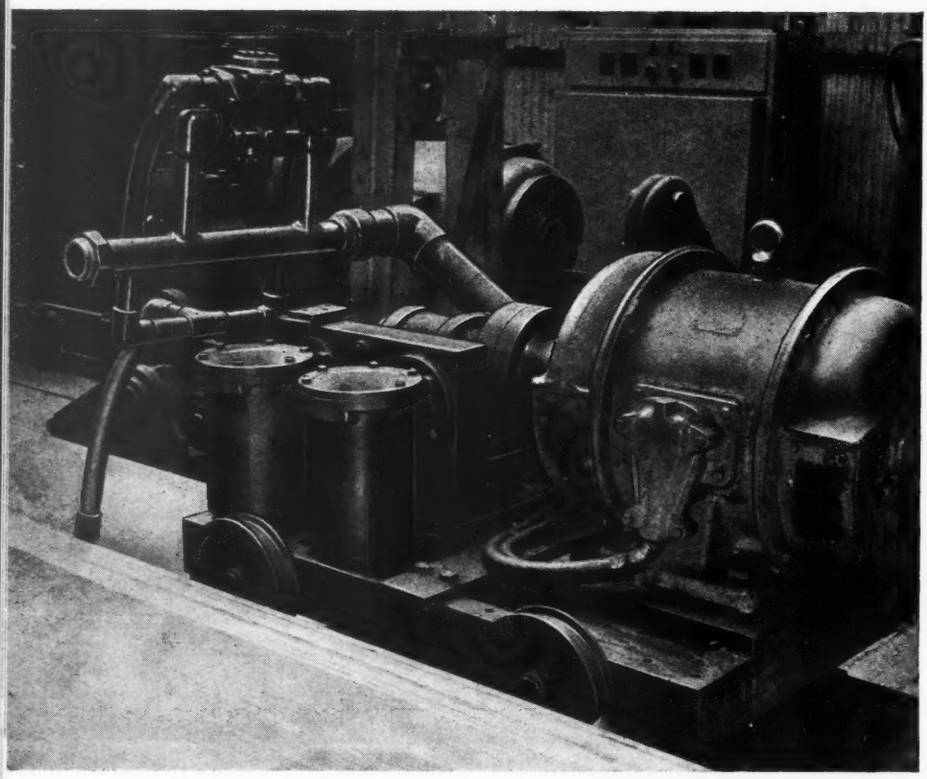


Fig. 6. Mobile coolant pump unit is mounted on wheels at the rear of the lathe bed. Guided by rails, the unit can deliver coolant to any required point.

which had an output of 67 gallons per minute at 300 pounds per square inch pressure, was found inadequate for bores of more than 3 or 4 inches in diameter, depending upon the length to be bored, and it was therefore replaced by one of greater volumetric capacity.

The new pump, shown in the illustration, is of the double helical-rotor type driven by a 33-H.P. motor, affording alternative deliveries of 140 gallons a minute at 230 pounds per square inch pressure, or, by fitting other gears, 100 gallons a minute at 300 pounds per square inch. In addition, two magnetic separators are installed on the intake side of the pump to trap any metallic particles.

An automatic, contactor type, totally enclosed control panel is mounted by the headstock. There are three sets of push-buttons—one set is mounted on the headstock, a second is situated on the boring-bar saddle, and the third is on one of the boring-bar steadyrests. In addition to the push-buttons at the bar saddle, an ammeter is provided at that station which gives indications of the current in the main-drive motor circuit, and is kept under observation when boring is in progress. Any sudden rise in the meter reading denotes a tool failure or similar defect, and immediate action can then be taken before serious damage results.

Special care has been taken to insure that the bed of the machine, which is a flat-topped box casting supported at floor level along its full length, is adequately seated to insure freedom from vibration. To this end, it is mounted on a large mass of concrete, 3 feet in depth and weighing 120 tons.

The cutter-heads employed in high-speed trepan-boring are of the type shown in Fig. 7. They are made from alloy steel in the normalized condition, and are accurately machined to insure interchangeability. Each head comprises a hollow, cylindrical body, to the forward edge of which is attached a single tungsten-carbide cutting tool. This tool, examples of which are seen with the heads in the illustration, consists of a 0.60 per cent carbon-steel holder, to which is brazed the carbide tip. The portion supporting the tip is of rectangular section, and accurately fits a slot *A*, in the body, while the rear portion is reduced to a circular section. This circular portion serves as a shank and is accommodated in a corresponding hole in the body, where it is locked by a set-screw.

The cutting edge of the tool is designed in such a manner that the width is divided into three equal portions, with the central portion projecting beyond those on either side by an amount approximately equal to the width of the chip-breaker groove. The outer portions are slightly inclined toward the rear. Diametrically opposite the cutting tool (at lowest position on cutter-head seen at left), a tungsten-carbide steady-pad is dovetailed into the outer surface of the body, while a second pad is provided midway between the bottom pad and the cutting tool.

The second pad serves to steady the head

against the work-bore and resist the cutting loads, while the pad opposite the cutter controls the size of the bore. This controlling action is entirely automatic—if the cutting tool tends to cut over size, and the bore is locally enlarged, pressure on this pad is relaxed. Immediately this relaxation takes place, the tool and head tend to move downward until an equilibrium is again established, meanwhile reducing the diameter.

Similarly, if the tool tends to cut undersize, the reduction of bore diameter immediately gives rise to an increased pressure on the pad, which, when transferred to the tool, gives a deeper cut and automatic correction. This automatic action is obtainable only with the arrangement described, and will not occur with fewer pads. The number of pads employed is the minimum, whereas additional pads would not only be superfluous, but undesirable.

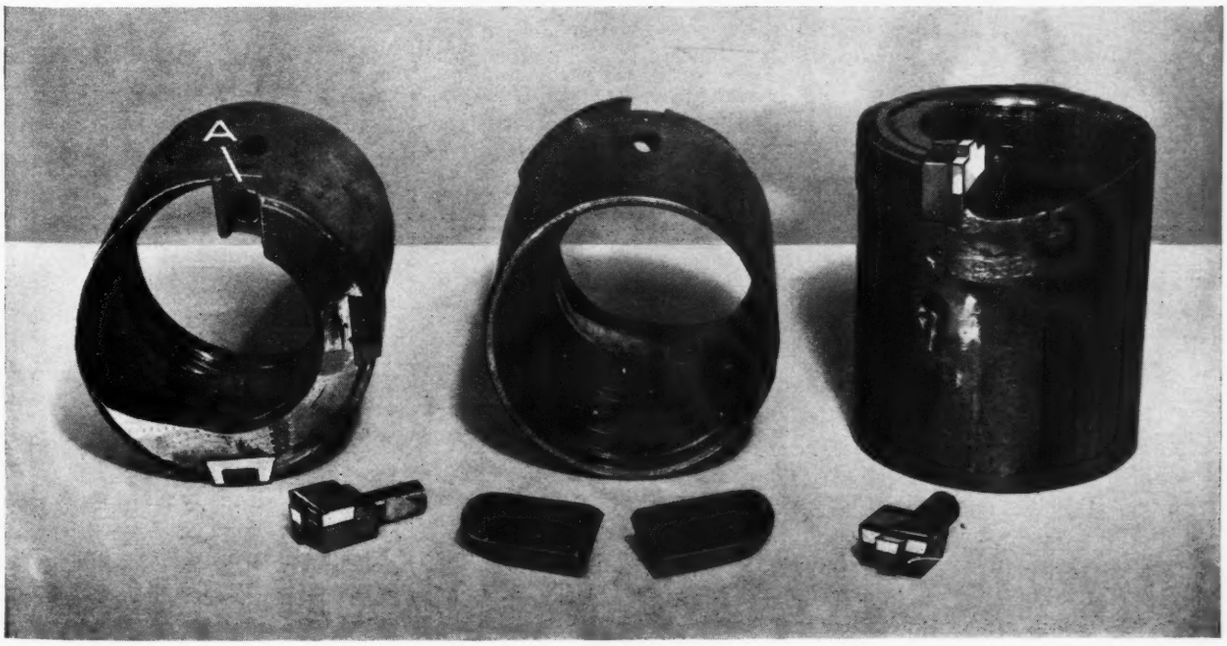
The carbide pads are brazed into shoes of 0.60 per cent carbon steel, these shoes being made a driving fit in the dovetail slots of the body. When assembled, they are ground to a diameter 0.008 inch smaller than the over-all diameter of the cutter. The leading edge of each shoe is slightly relieved and chamfered. This arrangement exposes the sharp leading corner of the carbide pad so that a scraping action is obtained, which thus prevents small particles from wedging in between the pad and the work-bore. The trailing portion of the shoe, however, is level with the surface of the pad, in order to avoid flaking away of the rear edge of the carbide.

As will be seen from Fig. 7, the wall thickness of the cutter-head body is greatest and uniform over the half-circumference in which the cutter and pads lie. Over the remainder, the thickness tapers from the diameter-controlling pad, to a point diametrically opposite the cutting load pad. In the quadrant between this point and the cutting tool, the reduced thickness is uniform, while the forward portion of the bore is smoothly flared. This flare provides the thinner-walled portion with a funnel-like entry which facilitates the removal of chips and the flow of coolant. The head described is used for trepan-boring diameters from 1 3/4 to 6 inches. Below 1 3/4 inches in diameter, trepanning is impractical.

Removal of chips is effected by introducing the coolant, under high pressure, into the annular space between the outside of the tubular boring-bar and the wall of the work-bore. For this purpose, a rotating oil-seal pressure-head is provided between the bar and the work, and the coolant flows from the outer annular space, through the cutting zone, and into the open end of the head. It is then discharged, with the chips, through the bore of the bar, and emerges from the opposite end. There it is collected and returned to the tank.

The arrangement of the pressure-head and that of the machine when set up for this method of operation are seen in Fig. 8. From the investigations made in Germany, it was evident that the various types of oil-seals there employed had been a source of trouble, one of the main

Fig. 7. Three typical trepanning heads employed for high-speed boring. Two carbide-tipped cutting tools and a pair of dovetailed steady-pads are seen in the foreground.



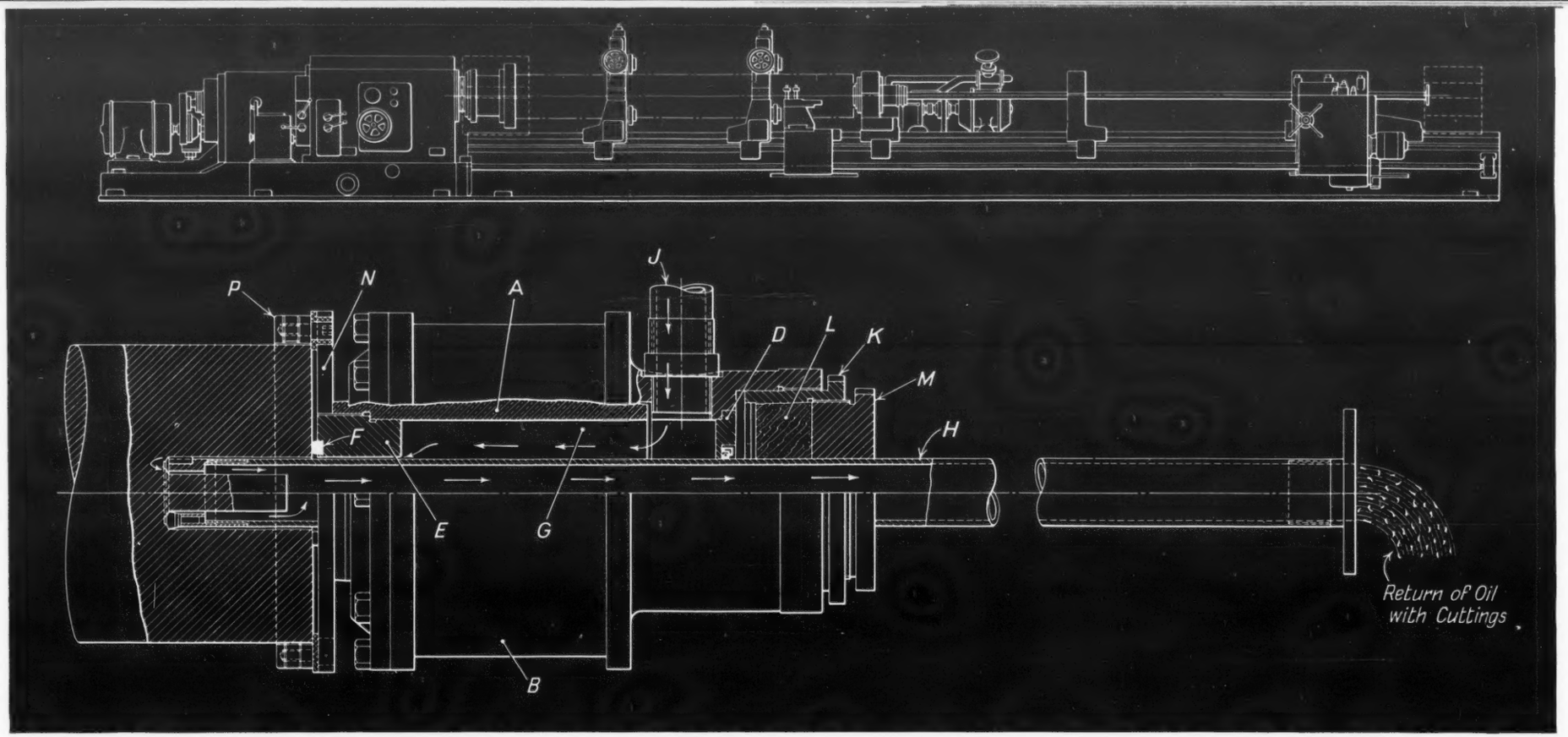


Fig. 8. Lay-out of machine seen in Fig. 4 as set up for high-speed trepan-boring. Seen at the bottom is the pressure-head, partly sectioned to show the arrangement of the oil-seals and bushings.

difficulties being the maintenance of oil-tightness. Accordingly, it was decided to design a completely new type of head, as shown in Fig. 8. This design has proved highly successful, and has been in almost continuous operation since it was originally constructed. The sealing arrangements have been found adequate for the prevention of oil leakage under all conditions, and an important feature is the absence of vibration.

In the new type of pressure-head, an inner sleeve *A* revolves on two tapered roller bearings in a casing *B*. The casing is machined externally to fit the bore of one of the boring-bar steady-rests, in which it is firmly gripped. Between the casing and the inner sleeve, oil-sealing rings (not shown) are provided to retain the lubricating oil in an annular chamber in which the bearings are housed. An additional ring of the same type prevents the coolant from entering the bearing chamber. Another sealing ring is mounted in a non-rotating section *D* of the body assembly, and prevents the escape of cutting oil to the rear between the surface of the boring-bar and the stationary section. Screwed to the forward end of sleeve *A* is a ring *E*, which is equipped with another oil-sealing ring *F*. This sealing ring, which is set in a recess in ring *E*, is held against the face of the work and surrounds the work-bore.

The inside diameter of ring *E* is such that there is an annular gap between it and the boring-bar *H*, this gap connecting with a larger space *G*, between the inside of the sleeve *A* and the external surface of the boring bar. Thus, cutting oil introduced under pressure into the

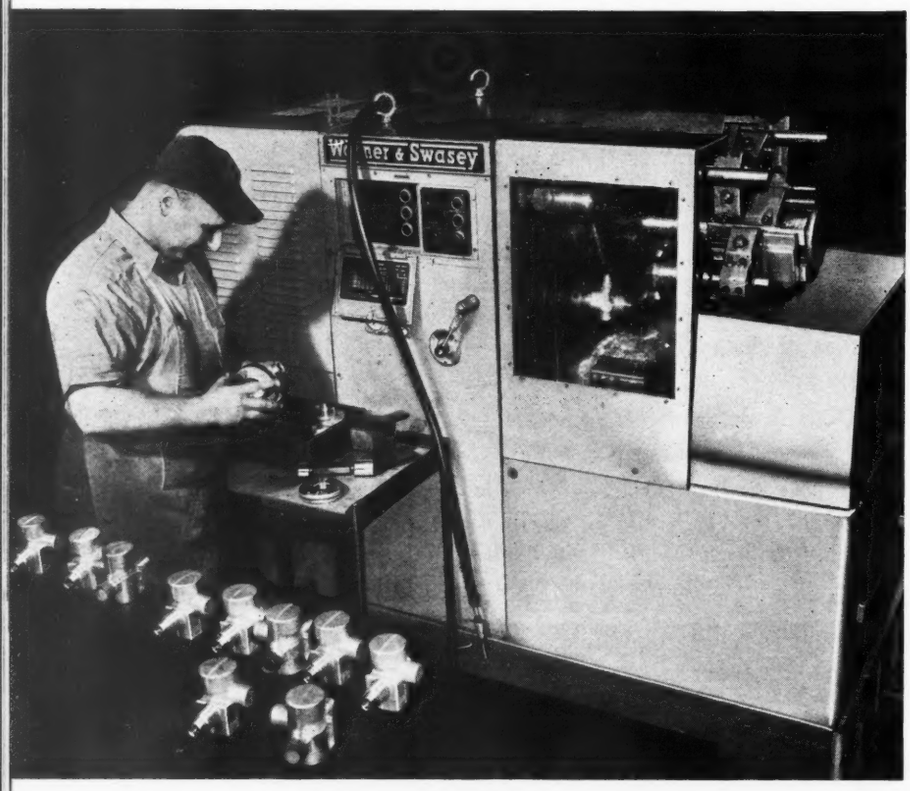
casing through the connection at *J*, fills the space *G*. From this space, it flows forward through the gap at ring *E*, and into the gap between the bar and work-bore. In order to steady the bar and to damp out any vibration, a wooden pack-bushing *L* surrounds the bar at the rear end of the pressure-head. The rear end of the body is threaded to receive a steel sleeve *K* having a tapered bore, in which is inserted the wooden pack-bushing *L*.

Divided into three segments, this bushing is retained by a gun-metal nut *M*, which thus affords a means of adjusting the pressure on the bar. In the illustration (which is to scale) the set-up is for trepanning a hole 3 inches in diameter. For other sizes—up to the maximum of 6 inches in diameter—the ring *E*, the wooden bushing, and the member *D*, together with the corresponding oil-seal rings, must, of course, be changed. The drive is transmitted to sleeve *A* by means of a disc *N*, which is screwed to the ring *E*. A ring *P* is attached to the end of the work by radially disposed set-screws. Two pegs project from the face of this ring and engage corresponding holes in the disc *N*. The holes in the disc are of larger diameter than the pegs, and are equipped with leather or rubber bushings so that a vibration-dampening transmission is again provided.

Typical procedures and some characteristic performances obtained in high-speed trepan-boring, as well as details of tool preparation and maintenance, will be described in the second article, to be published in a coming issue.

The solid core, 1 1/8 inches in diameter, seen in the illustration was obtained in trepan-boring a hole 2 5/8 inches in diameter and 48 inches long through 8-inch diameter alloy steel bars on a high-speed trepanning lathe in the Pittsburgh plant of the Heppenstall Co.

Automatic Chucking Machines



Single-Spindle Automatic Chucking Machines, Used for Primary Operations on Castings, Forgings, and Cut-Off Slugs, as Well as for Secondary Operations on Screw Machine and Turret Lathe Parts, Speed Production and Reduce Costs. This Article Describes the Set-Ups and Tooling Used in These Machines in the Manufacture of Complicated Valve Parts

A BATTERY of Warner & Swasey single-spindle automatic chucking machines has substantially reduced costs of parts requiring a series of lathe operations at the Belleville, N. J., plant of Walter Kidde & Co. These machines have a five-station, or pentagon, turret in a horizontal plane directly above the spindle, and front and rear cross-slides. Work is chucked in the spindle, and as the spindle revolves, the turret can feed longitudinally and the cross-slides transversely.

Cutters for turning, drilling, boring, and threading operations are supported in standard tool-holders from the pentagon turret, and are operative when their respective stations are indexed to lower-most, or working, position. Cutters for facing, grooving, and plunge forming operations are likewise supported on the cross-slides. Either cross-slide can function simultaneously with the movement of the turret or during a dwell of the turret. The cross-slides can also be used to actuate facing or recessing cutters sometimes carried on the turret. This is accomplished by means of a pusher fastened to one side of the rear cross-slide.

Automatic control of spindle speeds, feeds, length of cut, and the dwell of the turret and two cross-slides is accomplished by means of limit switches. Eight spindle speeds are available from any given set-up of change-gears through the use of four automatic changes and a "high-low" shift lever. Eighteen different feeds can be selected, ranging from 0.002 to 0.083 inch per revolution of the spindle. Air-operated chucks accommodate work up to 14 inches in diameter.

Only one operator is required for each two machines, and for optimum production in this plant, adjacent machines are installed at right angles to each other. When the operator is not serving either machine, he is free to inspect finished work, load work fixtures, deburr work, or perform some other bench operation.

The chucking machines are used for primary operations on forgings, castings, and cut-off slugs, and also for many secondary operations on work coming from other machine tools, such as screw machines and hand-operated turret lathes. Although quantities of 60,000 pieces or more are not unusual, forgings and castings at this plant are ordinarily machined in lots of 2000 or 3000—an ideal run for single-spindle automatics. Parts are made from carbon and alloy steels, stainless steel, aluminum, and magnesium, as well as from free-machining and naval brasses.

Cut Valve Production Costs

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As previously mentioned, the speeds and feeds used for any sequence of operations change automatically. This is accomplished by setting feed and speed dogs on a control drum connected to the pentagon turret and supported by a shaft which passes through the head of the machine. The drum can be seen in Fig. 1, where an operator is shown adjusting a speed dog. Each face of the drum is slotted to accommodate the feed and speed dogs, these being adjusted lengthwise in the slots to trip limit switches controlling the feed rate and spindle speeds.

The position of the dogs also establishes the point at which the motion of the turret changes from rapid traverse to feed, and also the point at which a shift in spindle speed can be made. A cam drum assembly is visible at the rear of the control drum in the illustration, and to the left of it can be seen an index drum. Each of these units is conveniently located to facilitate the set-up of the machine.

A drawing of a solenoid shell, typical of the many valve parts produced in these automatic chucking machines, is shown in Fig. 2. The part is forged from S A E 1112 steel. After the preliminary operation of turning the small end to provide a chucking surface, the work is placed in the air chuck of one of the machines, Fig. 3. (In this illustration, as in several others, the machine is shown without guards, to permit an unobstructed view of the tools and chucking area.) At the first turret station, a carbide-tipped cutter roughs the face and bore of the shell, and the 0.210-inch hole is spotted.

Spindle speeds automatically change from 340 to 142 R.P.M. for the different operations, and a feed rate of 0.003 inch per revolution is set. At the same time that the first station is operative, a cutter supported from one of the cross-slides roughs the outside diameter.

Cutting tools supported in the second station drill the 0.210-inch hole 1 3/16 inches deep, finish-turn the 2.640-inch diameter, and chamfer the bore. The spindle runs at 612 R.P.M., and the feed remains at 0.003 inch per revolution. Fig. 4 shows a close-up view of the second station with the tools in operative position.

At the third station, a special end cutter finishes the 2.316-inch bore and the 90-degree angle of the nozzle, holding the 1.031- and 0.281-inch lengths. This cutter also turns the 1.138-inch diameter 0.020 inch over size. Simultaneously, a cutter in the second cross-slide moves in to finish the face. Spindle speeds range from 340 down to 142 R.P.M. with a feed of 0.003 inch per revolution. At the fourth station, a single-point cutter finishes the 1.138-inch diameter of the nozzle, while at the fifth station another single-point cutter finishes the 2.328-inch diameter of the bore. For both of these stations a

Fig. 1. Initial selection of speeds and feeds on this automatic chucking machine is quickly accomplished by adjusting dogs along a control drum.

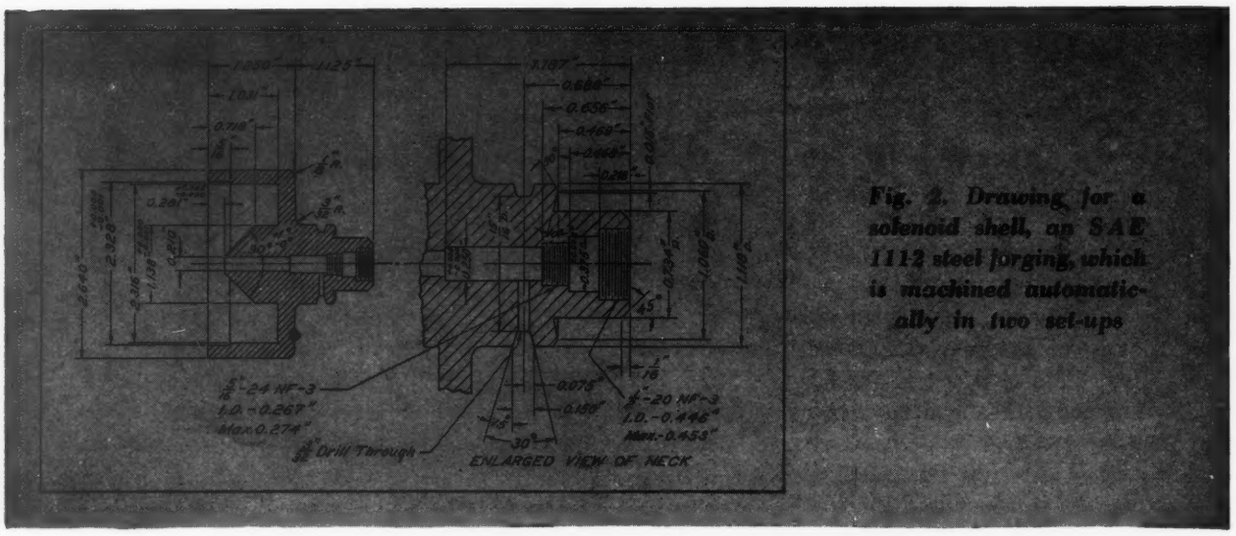


Fig. 2. Drawing for a solenoid shell, an SAE 1112 steel forging, which is machined automatically in two set-ups

spindle speed of 612 R.P.M. is used with a feed of 0.003 inch per revolution.

The cycle time required to complete this end of the solenoid shell is approximately 3 1/2 minutes. Each work-piece can be quickly inspected by the operator after reloading and starting the machine.

Another automatic chucking machine is set up for machining the opposite end of the shells. At the first turret station of this second machine, a step cutter roughs out the two thread diameters and the 0.250- and 0.375-inch diameters shown in the drawing, Fig. 2. The cutter used was adapted from a standard 7/16-inch high-speed steel drill by grinding cutting edges to produce 0.240-, 0.261-, 0.360-, and 7/16-inch diameter steps of required lengths. At the same station is a cutter which rough-turns the 1.118- and 0.734-inch diameters, and forms the 45-degree chamfer. Spindle speed and feed rates

Fig. 3. Loading one of the solenoid shells into the air chuck of a single-spindle automatic chucking machine

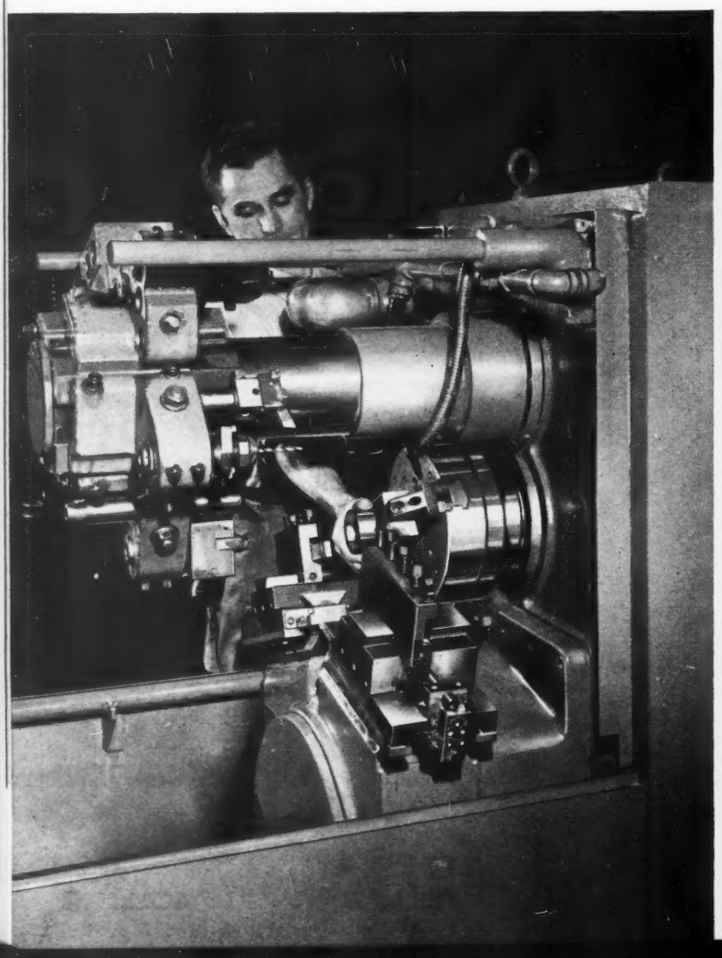
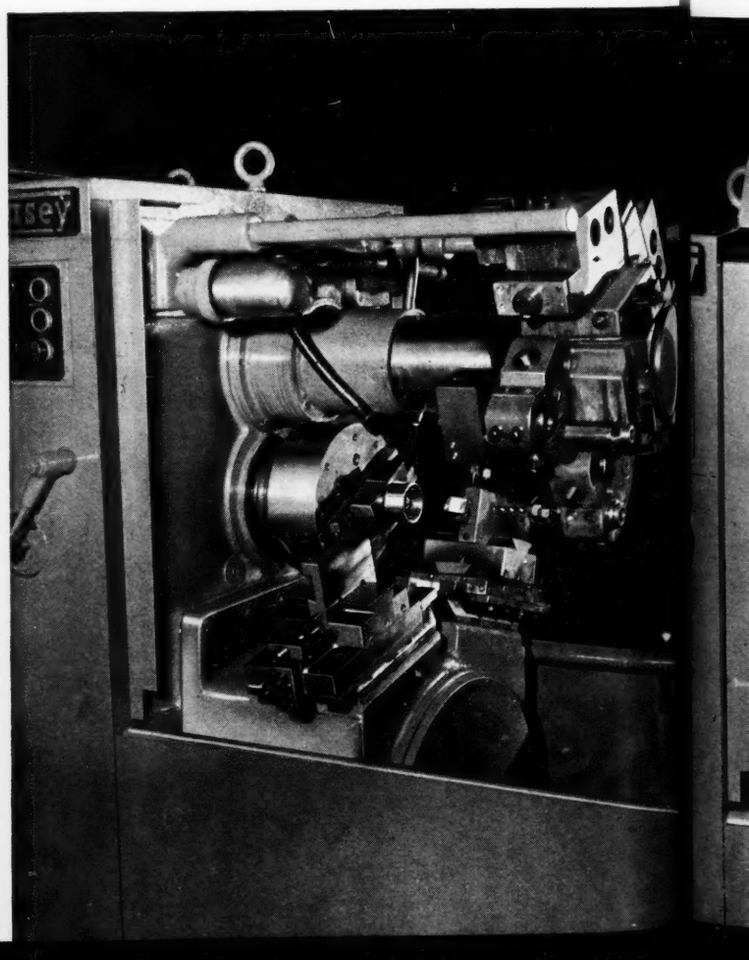


Fig. 4. This pentagon turret is indexed to bring the tools in the second station into operative position.



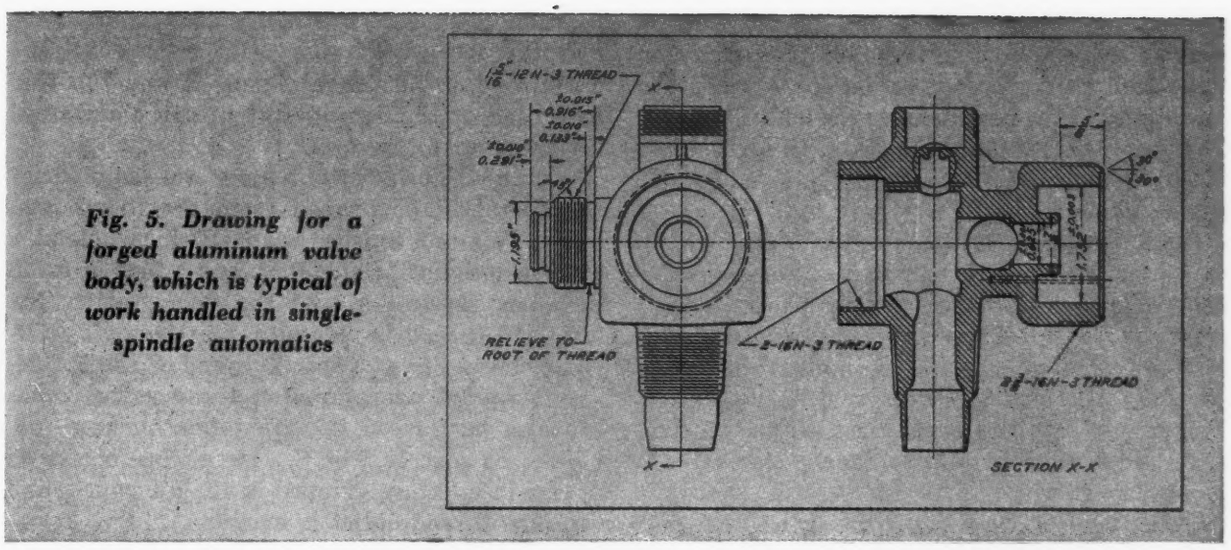


Fig. 5. Drawing for a forged aluminum valve body, which is typical of work handled in single-spindle automatics

for these operations are 612 R.P.M. and 0.003 inch per revolution, respectively.

All four diameters are finish-bored by another step cutter supported in the second station of the turret. At the same time, tooling supported in one of the cross-slides forms the 30-degree (included angle) groove, and roughs the back face of the 2.640-inch diameter. Spindle speeds and feeds are the same as for the first station.

The back face is finished to hold the 1.125-inch length, and the 1.118-inch diameter neck is finish-turned from the third station. Simultaneously, a hollow mill finishes the 0.734-inch diameter and forms the 10- and 30-degree angular surfaces on the face of the neck. For the above operations a spindle speed of 340 R.P.M. and a feed rate of 0.003 inch per revolution are used. At the fourth and fifth stations, the 5/16-24 and 1/2-20 holes are tapped with a spindle speed of 102 R.P.M.

Fig. 6. Third station of valve-body set-up indexed to operative position, with turret tools about to bore, counterbore, and chamfer

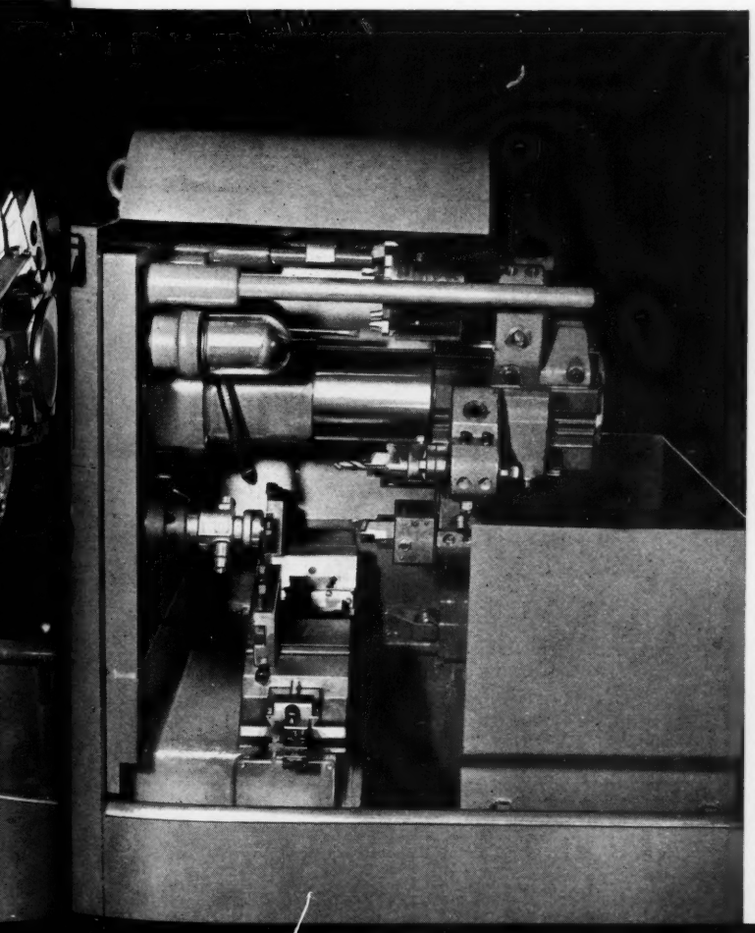
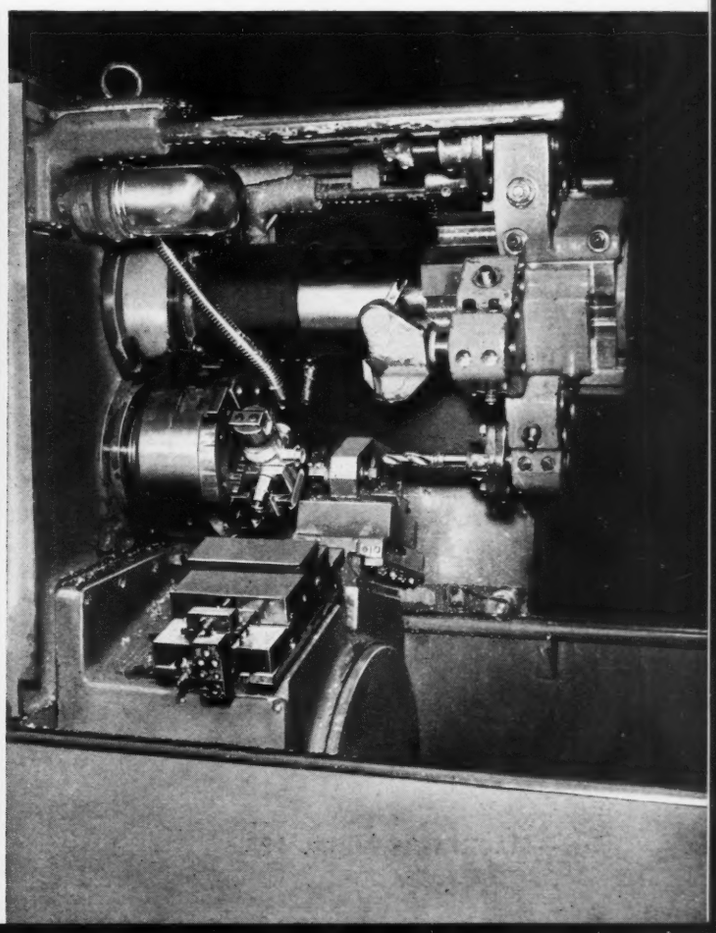


Fig. 7. A special fixture is used in the air chuck for holding the valve body during subsequent machining operations on a small boss.



The cycle time for this end of the shell is slightly more than four minutes per part, and inspection can proceed, as before, during the machining of the next piece in the lot. The 3/32-inch radial hole is produced in a drill press, after which the completed shells are degreased and cadmium-plated.

One of the most interesting parts produced in these machines is an aluminum forged valve body. The drawing for the completed part is shown in Fig. 5. The work is chucked by means of a threaded adapter which engages the 2-inch threaded hole machined in a prior operation. This set-up can be seen in the heading illustration, where the operator is shown inspecting a finished part while the machine is in operation. An adapter ready for loading can be seen in a vise in the foreground. A special two-diameter cutter in the first turret station rough-bores the 0.625- and 1.752-inch holes, and an overhanging single-point cutter rough-faces the end of the valve body. Speeds range from 1498 to 832 R.P.M., with feeds of 0.009 to 0.003 inch per revolution for these operations.

At the second station are set up cutters that turn the 2 3/8-inch thread diameter, and turn and chamfer the inner boss. The rear cross-slide operates with this station, carrying a cutter which forms the 30-degree chamfer at the end of the thread. Spindle speeds range from 1498 to 251 R.P.M., with a feed of 0.003 inch per revolution.

In Fig. 6 is shown a close-up view of the machine with the third station indexed to operative position. Here, the 1.752-inch hole is finish-bored, and the 2.094-inch step is counterbored and chamfered. The range of speeds and the feed rate used at the second station are maintained for these operations.

A standard 0.750-inch reamer was adapted for the operation performed from the fourth station. This tool finishes the 0.625-inch hole at a spindle speed of 1498 R.P.M. and a feed of 0.003 inch per revolution. At the final station, the 2 3/8-16 thread is cut with a self-opening circular-chaser die, at a spindle speed of 139 R.P.M.

Subsequent operations on these valve bodies are also performed in automatic chucking machines, as seen in Fig. 7. Here, the forging is nested in a fixture gripped in the air chuck, and the pipe thread outlet is machined. Two forming tools set up in the first turret station produce the rough contour of the pipe thread taper. An internal diameter is drilled from the second station, while at the same time a circular form tool on the rear cross-slide finishes the small end of a boss. At the third station, the thread is cut with a self-opening die, and at the fourth station a radius tool cuts a sealing groove.

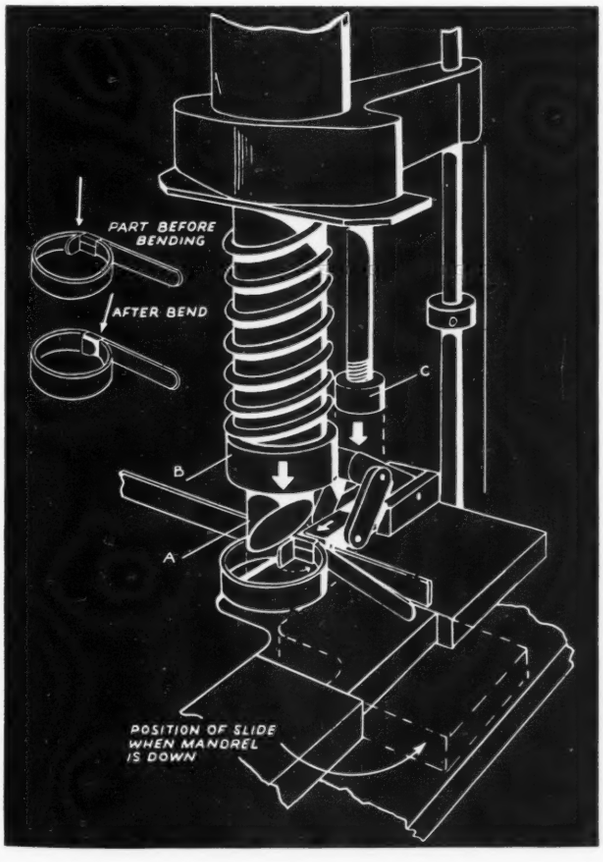
The operations described are representative applications of these machines. In addition to the small amount of time required for setting up jobs and for changing over from one job to another, the productive capacity can be considerably increased by careful planning of the tooling for any given job. In general, the tools and tooling principles are the same as those for hand-operated turret lathes.

Tab-Bending and Forming Steel Hose Clamps

Fig. 1. A clamp from the feed hopper at the right is placed in a guide recess for a tab-bending and arching operation in a Denison Multipress.

AN automatic Multipress employed in a tab-bending and "arching" operation on ten different sizes of preformed galvanized steel hose clamps is here shown. This 4-ton press is installed at Punch-Lok Co., Chicago, Ill., and is doing work which previously required two machines and a counting and packing operator.

In the Denison Multipress set-up, a large hopper situated at the right of the press maintains a supply of parts to be worked, Fig. 1. The operator takes a part in her right hand and simply locates it under the ram, where it fits into a guide fence recess. On the down stroke, Fig. 2, the mandrel moves 1/2 to 7/8 inch, according to the pre-set stroke length, before it enters the circular form of the clamp; then the helix-shaped mandrel begins to press against the clamp tab. After the mandrel has penetrated the clamp, a stripper pad presses against the top surface of the clamp. This pressure prevents the clamp from lifting, which would result in its being bent at the top instead of at a right angle.



As the mandrel stroke continues, using the final 5/16 inch of down stroke, the plunger behind it begins pressing a toggle switch arrangement, which, in turn, presses the arching pad against the lock. This forms the clamp lock to the shape of the pad and mandrel radii. The side thrust, developed through this operation, is counteracted by a block behind the mandrel opposite the toggle arrangement.

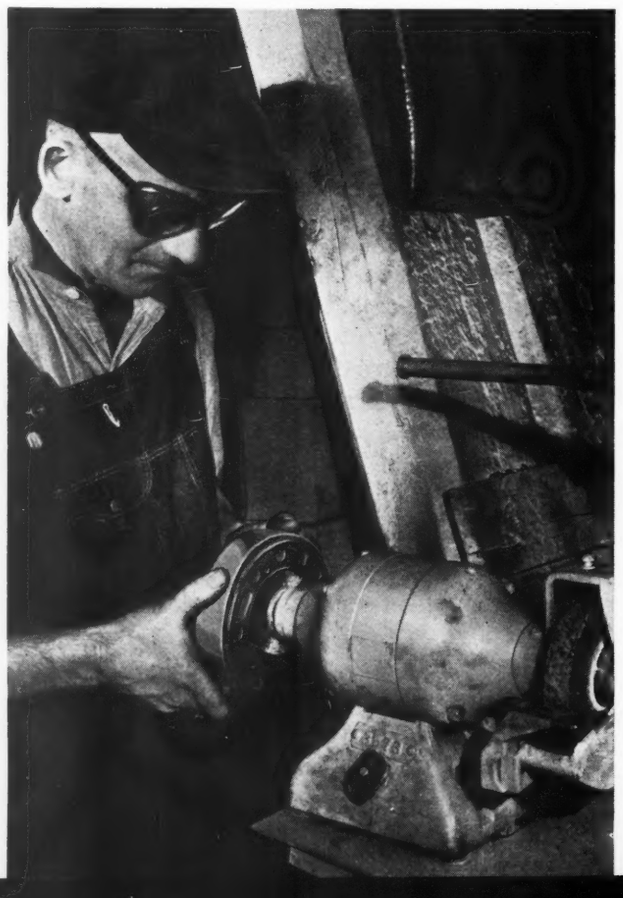
On the up stroke of the mandrel, the plunger releases the pressure on the toggle arrangement, and the arching pad returns to its original position by means of a spring action. The stripper remains seated on top of the clamp until the

Fig. 2. In tab-bending and arching the work at the left, a helical mandrel (A) enters the open portion of the work, after which the stripper pad (B) clamps the work in position. The rear plunger (C) actuates an arching pad to form the clamp lock to the pad and mandrel radii.

Fig. 3. Upon completion of the bending and forming operation, the work is carried on a belt to a counter tripping mechanism before it drops into a packing box.

mandrel penetrates it approximately an inch; then the stripper releases the clamp, leaving it in its original position on the supporting plate. The clamp is then pushed back onto a canvas belt as another clamp is placed in the guide fence recess. The finished clamp moves along on the belt, where it contacts a mechanism that trips a counter by means of an arm and cam as the completed parts drop into a packing box, as illustrated in Fig. 3.

The advantages gained by this set-up are largely due to the automatic hydraulic operation of this press. The length of the stroke can be pre-set to the minimum distance required for the job. Thus, with this shorter stroke, the cycle rate per minute is higher.



The inside diameter of the bottom cases of air-brake bushings is cleaned with an Osborn power-driven 3-inch wire brush in a fraction of the time that was required by a previous cleaning process.

Application of Oil Lubricants to Plain Bearings

First of Three Articles Describing Some of the Principles Involved in Lubricating Plain and Anti-Friction Bearings

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THE object of lubrication is to reduce friction between two surfaces, of which one or both are in motion. For example, a fluid film may be interposed between the two opposing surfaces of a journal and bearing to prevent metallic contact while the journal is in motion. This is known as "fluid film" lubrication, also as "viscous," "hydrodynamic," or "full film" lubrication.

However, lubricant may serve primarily to fill in surface imperfections or to reduce friction by making the opposing surfaces smoother or more slippery. This second type is known as "boundary" lubrication. A third type of lubrication—"extreme pressure"—is obtained under conditions of very heavy unit pressures, as ingredients contained in the lubricant react chemically with the metallic surfaces, or result in a plating action that tends to prevent seizure.

Fluid film lubrication involves the complete separation of a journal and bearing by an oil film. When fluid film lubrication is in effect, the journal and bearing are separated because of the hydraulic action of the wedge-shaped converging oil film. The load-carrying capacity is independent of the film strength of the lubricant. The coefficient of friction is directly proportional to the absolute viscosity of the oil and to the bearing speed, and inversely proportional to the unit pressure.

In order to obtain fluid film lubrication, the lubricant must be capable of "wetting" the journal and bearing so that it will adhere to the revolving journal and be drawn into the pressure area. Also, the bearing and journal must be at a slight angle to permit the formation of a converging film. The clearance space between a radial bearing and its journal provides a crescent-shaped area on both sides of the pressure area in which the converging film is formed, and this space must be kept full of oil, Fig. 1. In addition, the viscosity of the oil must be sufficiently high to permit the formation of a load-supporting oil film under the prevailing conditions of bearing load and speed.

The lubricating film that separates the bearing and journal may be regarded as composed of many layers having a relative movement with respect to each other. One layer clings to the stationary bearing and another to the revolving journal, while in between the two are other layers in sliding contact or being continually

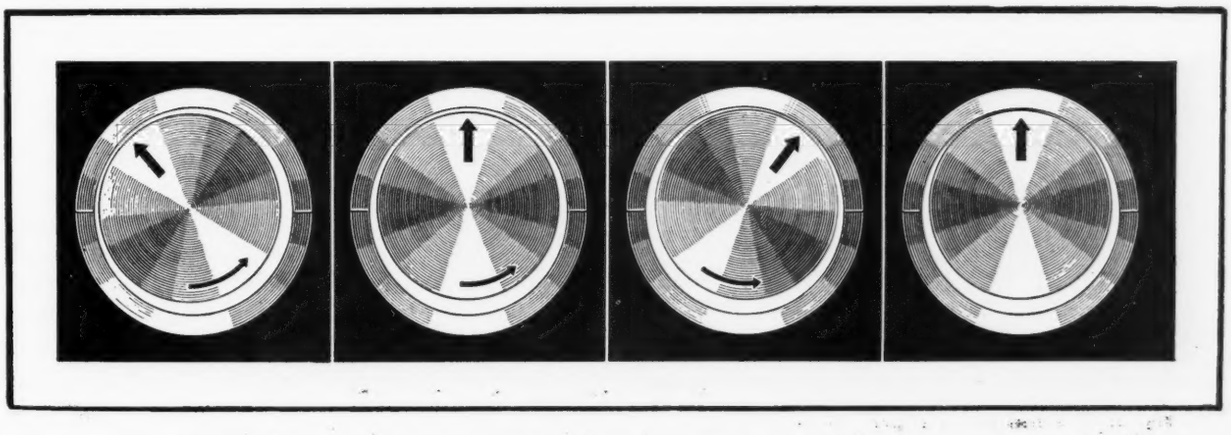


Fig. 1. Diagram showing the formation of a converging oil film between a plain bearing and a journal

sheared. The relative movement, or shearing, of these layers of oil results in the creation of fluid friction which becomes greater as the oil viscosity or the journal speed is increased. Higher journal speeds increase the thickness of the oil film because of the increased pumping action of the journal, and thereby permit the use of an oil of lower viscosity. Heavy loads decrease the film thickness and require an oil of higher viscosity than light loads.

In boundary lubrication, the lubricant serves primarily to make the opposing surfaces more slippery, and for heavy loads "oiliness," or film strength, is a factor. Friction will vary with both the viscosity and oiliness of the lubricant, as well as with the composition of the metals from which the bearing and journal are made.

There are conditions of extreme pressure, which are far more common with certain types of gears than with bearings, in which the unit pressures are so severe that reduction of friction becomes secondary to preventing the opposing surfaces from scoring or seizing. Extreme pressure lubricants are used for this service.

Extreme pressure lubricants should not be confused with materials, such as fatty oils, which depend upon "oiliness" for reducing friction. In general, the action of oiliness agents may be considered as physical and that of extreme pressure agents as chemical. The distribution of pressure in a typical oil-film bearing is illustrated diagrammatically in Fig. 2. The effect of a longitudinal groove in the pressure area of a bearing may be seen in Fig. 3.

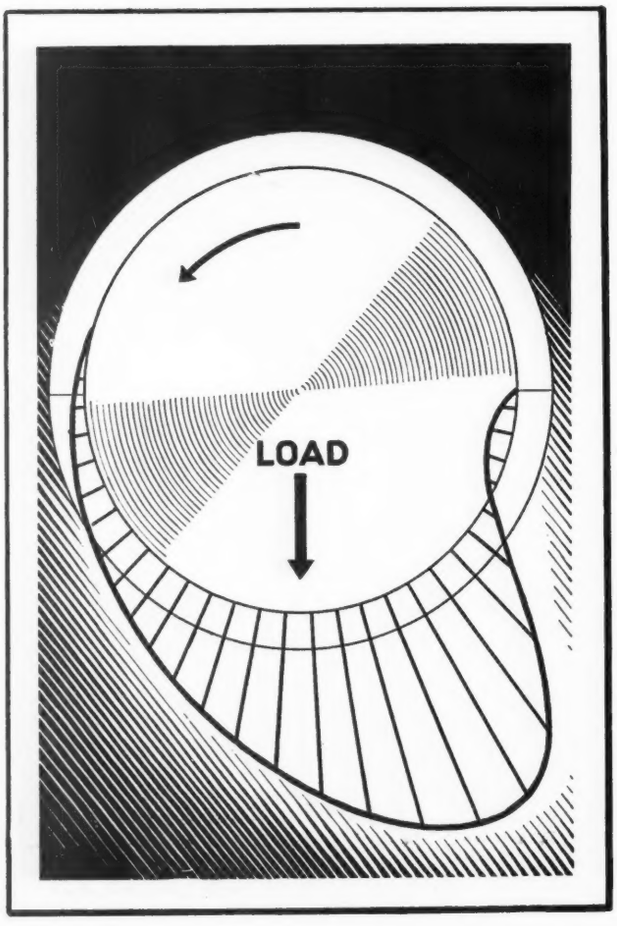


Fig. 2. The distribution of pressure in a typical oil-film bearing is illustrated in this diagram.

The attainment of efficient lubrication is dependent upon the design of the bearing, as well as upon the use of a correct lubricant and a suitable method of application. Grooves are necessary in most bearings for distributing the lubricant so that it will be carried evenly to all parts of the pressure area. The ability of the oil film to lift and support a heavy load depends upon the hydraulic pressure that results from the pumping action of the rotating journal. Therefore, any grooves in the pressure area which permit oil to escape from locations where it is needed will tend to destroy the film and may result in metallic contact.

Grooves should be used only when necessary for longitudinal distribution of the lubricant along the journal, and they should not be cut into the pressure area. Sharp edges of bearing segments and grooves should be chamfered or rounded to prevent scraping the lubricant from the journal. Grooves and chamfers should extend only to within 1/2 inch of either bearing end in order to minimize end leakage of the lubricant.

The lubricant should be supplied at a point in the bearing that is not under pressure. Heavily loaded, slow speed bearings should have the supply point closer to the pressure area than is required with lightly loaded bearings operating at higher speeds. When this is not possible, an auxiliary groove slightly ahead of the pressure area may be required to insure proper distribution of the lubricant.

The method of applying lubricant plays an important part in the effectiveness of lubrication in reducing wear and friction. Hand oiling at periodic intervals is inefficient because an excessive quantity of oil is usually applied at one time, and this quickly runs out, leaving the bearing without sufficient lubricant.

Drop feed oilers are devices which permit controlling the rate of oil flow by means of a needle valve. One type is a sight feed oil-cup, in which the falling drops of oil may be observed through a window below the reservoir. Another type of oiler has a supply tank which provides a hydrostatic head of oil at some distance above the bearing. This oiler is also fitted with a sight feed metering device. Oilers of this type provide a method of feeding many bearings from one central reservoir. For a given setting, the rate of

oil flow varies with the temperature and viscosity of the oil and with the level of the oil in the container.

Wick-feed cups consist of oil reservoirs or cups into which is dipped one end of a wick made of wool or similar material. The other end of the wick is carried above the oil level and into a tube that leads to the bearing. The oil feeds through the wick by capillary action. The rate of oil flow varies with the oil level in the cup, the temperature and viscosity of the oil, and the composition and construction of the wick. The rate of oil feed may be regulated by increasing or decreasing the number of strands of wick used.

Bottle oilers consist of a closed inverted glass container equipped with a metal spindle that passes from the oil reservoir through a fairly tight sleeve to the rotating journal. Oil is caused to flow by the slight vibration imparted by the revolving journal, and by variations in temperature which cause the air above the oil to expand and contract, thereby regulating the flow of oil to the bearing surfaces. Bottle oilers are automatic and are efficient when a small but uniform rate of oil flow is desired.

Ring-oiled bearings have a ring of considerably greater diameter than the journal; the ring rides on top of the journal and dips into an oil reservoir below. The rotation of the journal causes the ring to revolve and carry oil from the reservoir up to the bearing. A ring oiler is really a miniature circulation system, as the oil that drains from the bearing ends drops back into the reservoir. Collar- and chain-oiled bearings are similar in action to ring-oiled bearings. In the case of chain oilers a continuous chain is used, and collar oilers are provided with a metal collar which is fixed to the shaft and dips into the oil reservoir.

Splash lubrication is sometimes used when a revolving crank, rotating gears, or discs can be employed to splash oil from a reservoir onto parts requiring lubrication. Splash-lubricated parts are enclosed and channels are often used to collect the splashed oil and conduct it to bearings. Bath lubrication is a method in which the part to be lubricated is completely submerged in a bath of oil.

Circulation systems provide a constant and controlled flow of oil to bearings. The used oil drains into a reservoir and is recirculated. In a gravity circulation system, the oil flows from a tank located above bearings requiring lubrication. The used oil drains from the bearings to a sump or settling tank. It then passes through a filter or centrifuge and is returned to the gravity tank.

In a pressure circulating system, oil is pumped under pressure directly to parts requiring lubrication, but with this exception is similar to a gravity system. A circulation system is the most efficient and reliable method of oil application and one system may be used to supply oil to numerous bearings.

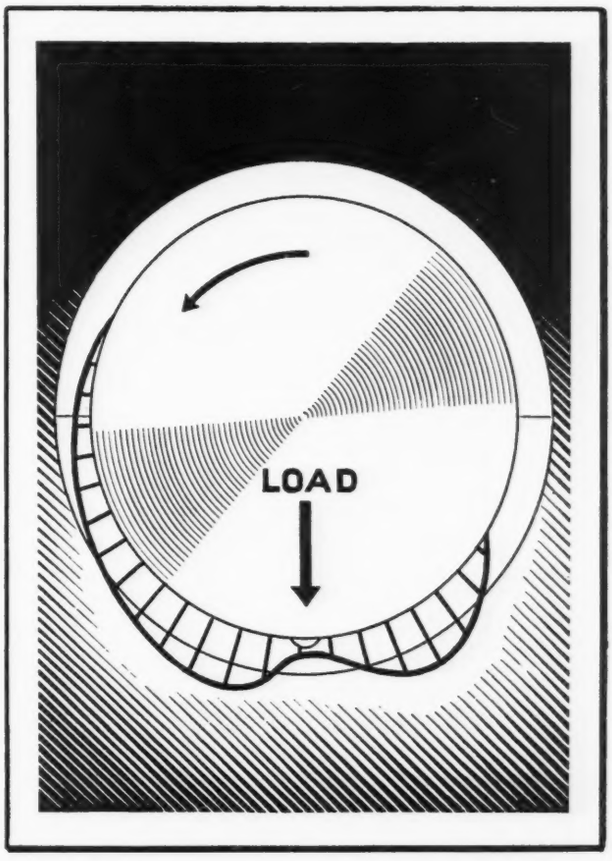


Fig. 3. Diagram of the effect on pressure of a longitudinal groove in the pressure area of a plain bearing

Mechanical force-feed lubricators consist of oil pumps which force oil directly to bearings at pressures, sometimes as high as 5000 pounds per square inch. The used oil is not recirculated, and the lubricator may be set to deliver oil at any required rate within the limits of the pump. This method permits a positive and closely controlled flow of lubricant. It is an "all-loss" method which does not involve re-use of the lubricant.

"One-shot" lubricating systems employ a pump, either manually or mechanically operated, which is connected by piping to the various parts to be lubricated. At controlled intervals, the pump forces lubricant to the bearings. Since the oil is not re-used, a highly refined circulating oil is not normally required.

Waste-packed bearings utilize wool waste, or a wool and hair mixture, which is dipped into a reservoir that contains lubricant. The waste is in contact with the journal. Oil is lifted by capillary action from the reservoir to the jour-

nal. Underfed bearings, of which the conventional railway-car journal is an example, usually consist of a half-bearing with wool waste packed in a box below the journal. Railway traction-motor armature bearings have an oil well on the side of the bearing. Waste carries the lubricant to the journal.

Proper packing of waste is very important on bearings of these types. A good quality of wool waste should be used, and it should always be soaked in oil and drained prior to packing. Cotton, although better than wool from the standpoint of capillarity, will pack down when wet and lose contact with the journal, thereby causing lubrication failure.

* * *

X-Ray Gaging of Pipe Wall Thickness

One of the important finishing operations in the manufacture of seamless steel pipe consists of cutting off the ragged ends. Excessive eccentricity near the pipe ends causes wall thickness variations, and any area that falls below the minimum allowable thickness must also be cut away. The correct crop length may vary in a single rolling from a few inches to several feet. Without an accurate device for determining this length, cropping may be a costly proposition.

Various gages used in the past for determining the cutting-off point have had limitations, from the standpoint either of accuracy or of manipulation. But X-ray operated pipe-wall thickness gages recently installed at the Ambridge, Pa., plant of the Spang-Chalfant Division of the National Supply Co. are proving very satisfactory in gaging and marking tubes for trimming, with considerable savings in material and labor costs.

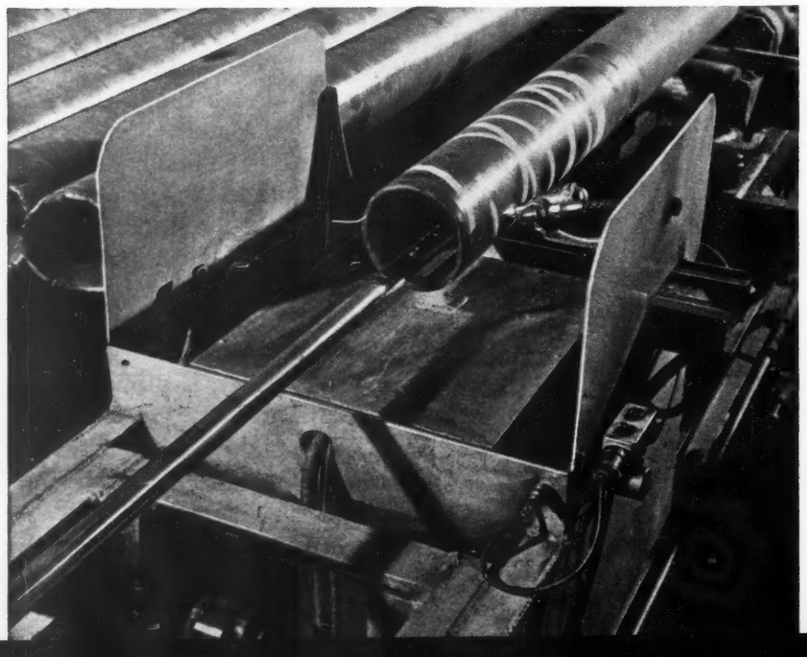
This equipment includes high-precision, non-contact, continuously indicating electronic micrometers which gage the thickness of the pipe wall and automatically mark under-gage areas for determining the crop point. They check wall thicknesses ranging from 0.050 inch to 1.500 inches within an accuracy of 1 per cent. Pipe with inside diameters of 3 inches or larger can be checked, and smaller diameters can be checked by using specially designed probes.

In the sequence of mill operations, the X-ray gages are located immediately beyond the roll straightener. Pipe coming from the straightener is conveyed to a stop aligned with the first X-ray gage, and is automatically thrown out onto skids. Manually controlled jack rolls pick up and rotate the pipe at 60 to 120 R.P.M. The X-ray equipment consists basically of an X-ray generator, enclosed in a ray-proof, shock-proof housing, and a pick-up unit mounted in a probe tube. Both are supported on a hydraulically operated, manually controlled buggy that is closely aligned with the jack rolls.

The generator radiates an X-ray beam approximately 3/8 inch in diameter through the steel wall of the pipe. As the probe tube is passed into the open end of the pipe, the pick-up unit receives the X-ray beam and converts it into an electrical signal. This is amplified to actuate an indicating meter and automatic servo-mechanism. The servo-mechanism sprays paint on the outside of the pipe at any point where the wall thickness is less than the predetermined standard for which the instrument has been calibrated. After the wall thickness is checked at one end, the pipe is conveyed to another X-ray gage at the opposite end of the skids, and the other end is checked in a similar manner.

The forward speed of the buggy is such that the pipe can be checked at the rate of 2 inches or more per second. The probe is designed to check each pipe end to a maximum length of 5 feet. Longer probes, however, are possible.

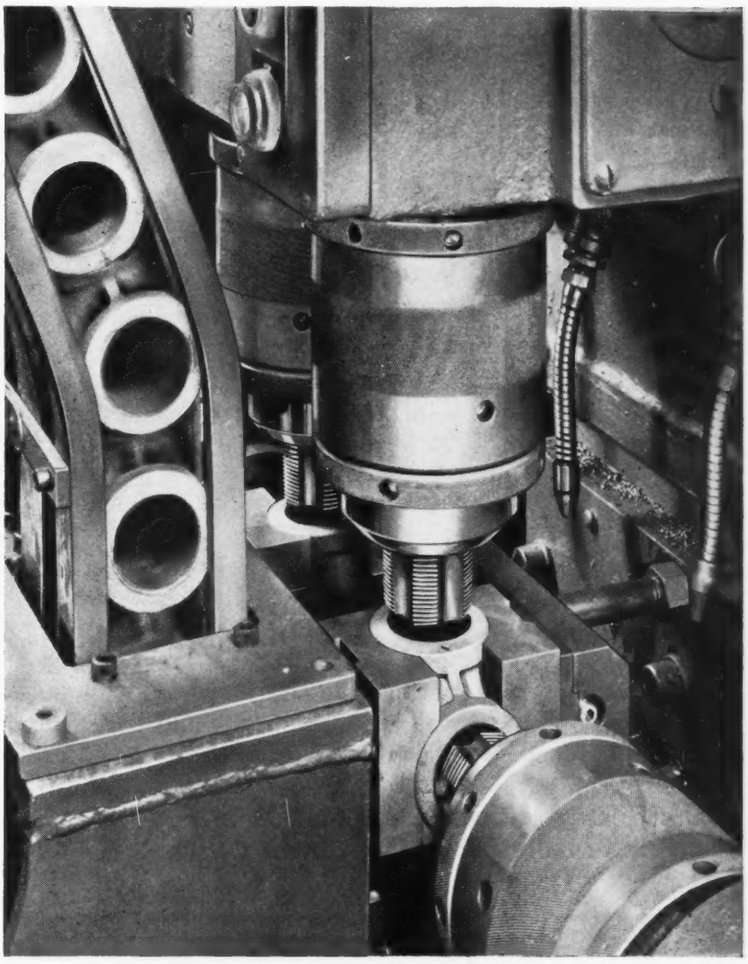
The gages described were designed by the Industrial Gauges Corporation of Englewood, N. J. All necessary electrical and X-ray protective measures are incorporated in the gages.



X-ray pipe-wall thickness gage with probe about to emerge from inside of pipe after completion of checking and automatic spraying of paint line to indicate under-thickness area to be cropped off

Threading Pipe Fittings on Automatic Machines

Improved Quality and Greater Production are Obtained with Less Manual Effort and Quieter Operation in Threading Pipe Fittings at the Grabler Mfg. Co. Entirely Automatic Lead-Screw Fed Tapping Machines Equipped with a Double Magazine Feed and Automatic, Air-Operated Chucking Fixtures Produce Two Pipe Tees or Elbows per Stroke



FASTER, more accurate threading of pipe fittings, such as those seen in Fig. 1, is being accomplished at the Grabler Mfg. Co., Cleveland, Ohio, by the use of completely automatic tapping machines. The machines are made by the Cleveland Tapping Machine Co., a subsidiary of Automatic Steel Products, Inc. They are equipped with double magazine feeding arrangements and automatic, air-operated chucking fixtures, as shown in Fig. 2, and complete two pipe tees or elbows per stroke.

Previously, although the pipe fittings were also threaded two at a time on special belt-driven machines designed by Grabler, they had a manual loading and hand-clamping arrangement which required more effort on the part of the operator. Now, with magazine feed and automatic clamping, greater production and more accurate fittings are obtained with reduced labor and maintenance costs. Set-up or change-over time has been reduced to a minimum.

The new automatic tapping machines are installed around a circle, with three machines in each group, as seen in Fig. 3. Consequently, one operator can easily attend all three machines. Cast pipe fittings are dropped into storage hoppers, conveniently located next to the magazines on each machine, from overhead pipe chutes shown in the illustration.

Two sizes of machines are currently being employed at Grabler—the smaller capacity machines handling pipe-fitting elbows or tees having American Standard pipe threads from 1/2–14 to 1–11 1/2 threads per inch, and the larger machines, from 1 1/4–11 1/2 to 2–11 1/2 threads per inch. Each machine threads two fittings at a time. The machines employed for threading elbows have two vertical, one right-hand, and one left-hand spindle; and the machines used for threading tees have two vertical, two right-hand, and two left-hand spindles. All spindles have their own hardened and ground lead-screw for feeding, with gun-metal bronze lead-nuts that can be adjusted to compensate for wear. Dif-

Fig. 1. Malleable iron pipe elbows are threaded two at a time on the completely automatic machine illustrated in Fig. 2.

ferent size fittings can be threaded simultaneously on the same machine, and the machines can also be used for street elbows, having an internal thread in the flanged end and an external thread on the opposite end, as seen at the left in Fig. 1.

All that is necessary for the operator to do is to keep the magazines loaded with castings. The cast fittings fall, one at a time, from the magazines into position between the work-holding jaws when the jaws have been automatically retracted to the loading position. The jaws are then closed to grip the casting, and slid forward into the threading position, as seen in Fig. 4 and the heading illustration, by means of the air-operated, toggle type shuttle fixture. With the double stacking arrangement, two pipe fittings are fed into the machine simultaneously. The holding jaws can be adjusted both vertically and horizontally to compensate for wear and misalignment, and the fixture is self-compensating, automatically re-centering itself after the work has been discharged.

Each spindle is equipped with an adjustable holder that carries both the tap (or chaser) and the chamfering tool. The spindle nose and the body of the holder are threaded to provide for quick adjustment of the tool either toward or away from the work, with positive means for locking the tool in the desired position. A cutting speed of 60 feet per minute is employed in threading malleable iron pipe fittings (compared to 40 feet per minute on the old belt-driven machines), and cutting speeds as high as 125 feet per minute are available for threading brass pipe fittings. Each spindle makes about twelve

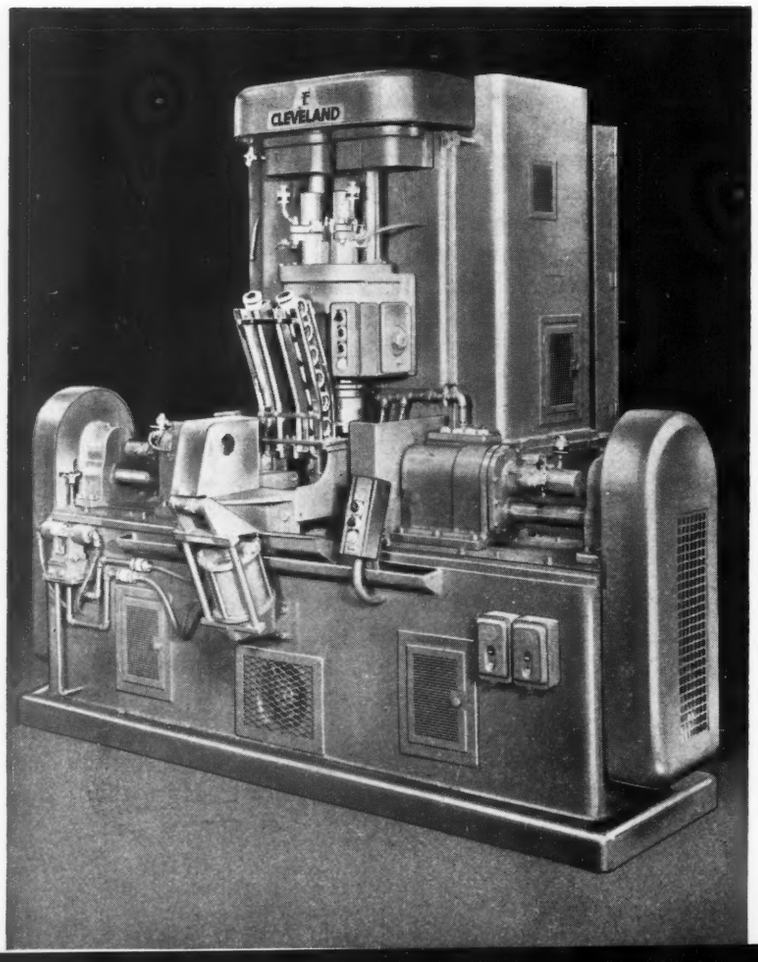


Fig. 2. This automatic threading machine for pipe fittings is equipped with a double magazine feeding arrangement and an air-operated chucking and shuttle fixture.

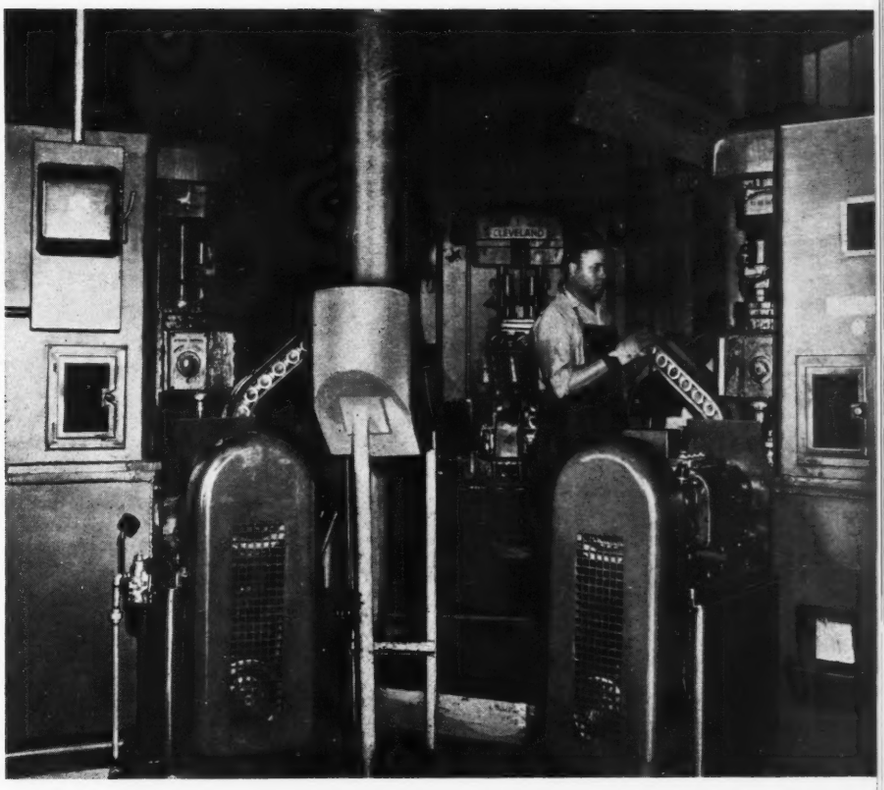


Fig. 3. Three machines are arranged in a circle for convenient operation by one man. Pipe fittings to be threaded are dropped into storage hoppers from overhead chutes.

revolutions while being fed into the work, and about twelve in reverse, to provide the necessary number of full threads, as well as to allow for chamfering and the required clearance for chucking.

Both side and vertical heads have their own controls, and can be set up independently. A control dial is used to adjust the length of stroke, and a safety switch and shear pins protect the spindles from damage in case of jamming. All of the tapping spindles, both horizontal and vertical, are interchangeable. In addition to the advantages previously mentioned, quietness is a feature of this tapping set-up.

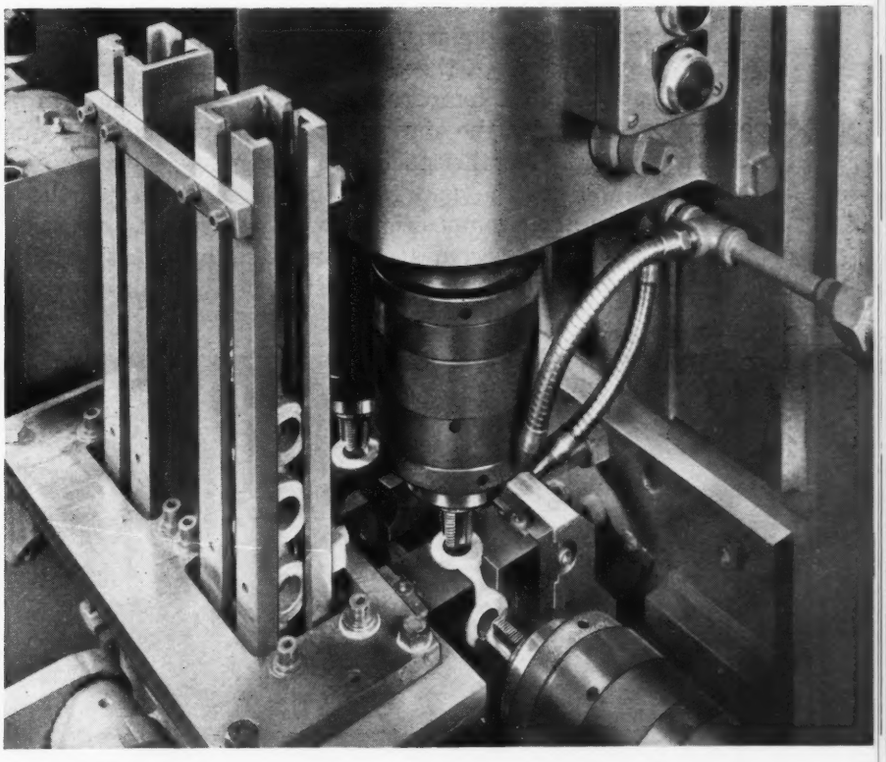


Fig. 4. Close-up view of the automatic threading machine showing jaws closed on two pipe fittings, with the taps about to be fed into the work-pieces.

How to Produce High-Quality

Carefully Selected Die Steels, Proved Design Principles, and Closely Controlled Die-Casting Alloys are Important Production Factors at the Hoover Co. — First of Two Articles

By HENRY H. RYFFEL

THE successful production of aluminum die-castings on a commercial basis requires the solution of many problems. The high melting point of aluminum poses a problem in die steel selection since some die steels are more susceptible to deterioration at high temperature than others. Of those steels less likely to deteriorate at high temperatures, some are subject to pitting by the dissolving action of molten aluminum. Another factor, alloy composition, may influence the quality of the castings produced if the alloy composition varies during a production run or becomes contaminated by indiscriminate "feeding" of the melting pot.

Many parts which are to be die-cast can be simplified or improved to facilitate die-casting or reduce tooling costs. Such recommendations as affect part quality and production economy are best made prior to submitting quotations rather than after an order has been received.

Practices of the Hoover Co., North Canton, Ohio, will be here described, beginning with the initial request for a quotation. The customer's drawing is first examined by the die-casting section of the engineering department and redrawn, if necessary, to show tolerances required for die-casting, allowances for machining, and any modifications in the contour of the part that would

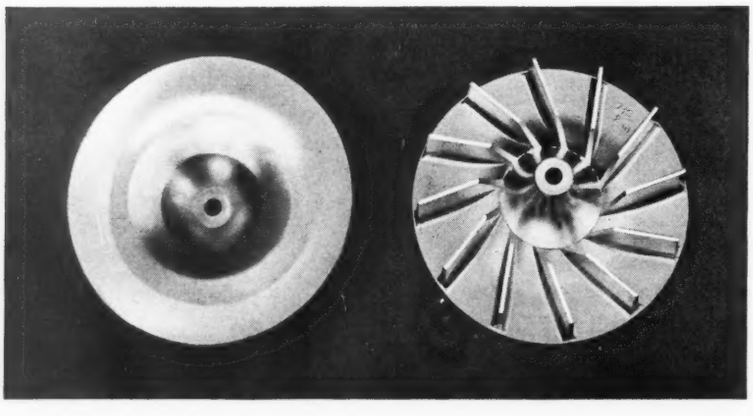


Fig. 1. Aluminum-alloy vacuum cleaner fan die-casting. High density and even distribution of the metal are obtained by using the segmental die illustrated in Fig. 2.

Aluminum Die-Castings

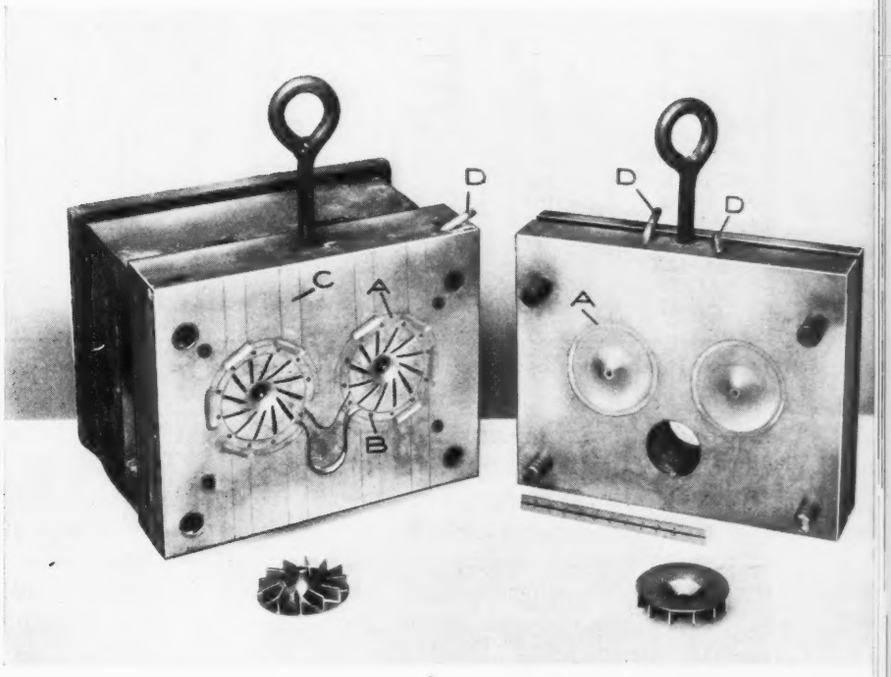


Fig. 2. Two-cavity die used to cast fan seen in Fig. 1. Each cavity consists of twelve hardened inserted segments fastened in a soft steel holding block.

simplify die-casting or improve its appearance. Modifications in the shape of a part are usually recommended for the purpose of eliminating under-cuts and extra movable cores, or providing a more favorable location for any flash line which might be formed in the die-casting process. All modified drawings are submitted to the customer for approval before actual design or construction of the die is begun.

After the die has been completed, a fifty-sample lot is produced and checked for dimensions, porosity, flow lines, and other physical properties. These samples are submitted to the customer for processing to determine whether or not there will be any difficulty in subsequent machining operations. Any changes required in the die as a result of tests on the sample lot are then made and the part is ready for full-scale production.

In all, thirteen aluminum-base alloys are available for use in the production of die-castings at the Hoover plant. These alloys have been found to possess sufficiently diverse properties for all aluminum die-casting requirements. The designation, composition, and physical properties of these alloys are given in the accompanying table.

To insure close control of composition, all alloys are prepared in the plant foundry using pigs of the pure alloying elements—aluminum, copper, etc. A molten sample is taken from each melt and checked for composition in the metallurgical laboratory. Before the melt is poured

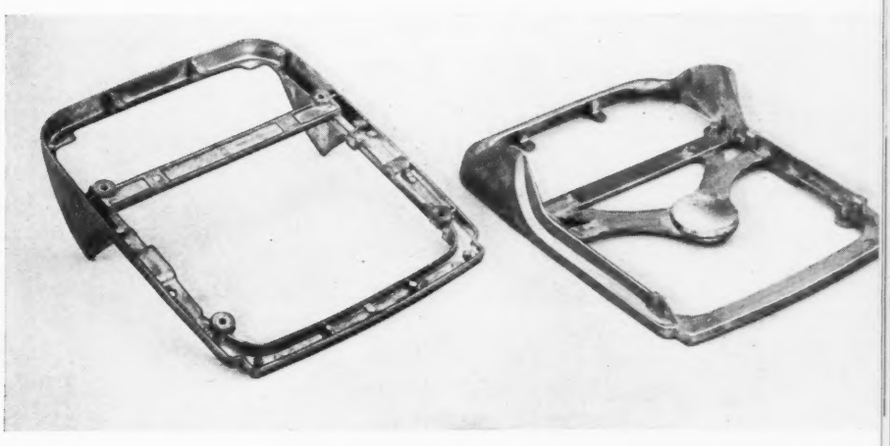


Fig. 3. Aluminum-alloy typewriter base. The widely separated areas on this die-casting must be accurately aligned to facilitate assembly with typewriter frame.

Alloy No.	ASTM No. B85-48T	Copper		Silicon		Magnesium		Iron, Maximum
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	
AL–43	S 4	...	0.6	4.5	6.0	...	0.1	2.0
AL–13	S 5	...	0.6	11.0	13.0	...	0.1	2.0
AL–13	S 9	...	0.6	11.0	13.0	...	0.1	1.3
AL–85	SC 2	3.0	4.0	4.5	5.5	...	0.1	2.0
AL–85	SC 5	3.0	4.0	4.5	5.5	...	0.1	1.3
AXS679R3	SC 6	3.0	4.0	7.5	9.5	...	0.1	1.3
AXS679R3	SC 7	3.0	4.0	7.5	9.5	...	0.1	2.0
A–360	SG 2	...	0.6	9.0	10.0	0.4	0.6	1.3
360	SG 3	...	0.6	9.0	10.0	0.4	0.6	2.0
AL–218	G 2	...	0.2	....	0.3	7.5	8.5	1.8
AL–13X	....	...	0.15	11.5	12.5	...	0.05	0.8
AL–73	....	1.0	3.0	7.0	9.0	...	0.1	2.0
AL–81	....	6.0	8.0	....	3.5	...	0.1	2.3

Note: Physical properties are average for die-cast specimens, but not for specimens cut from die-castings.

into molds of convenient size for handling, a final check on the composition is made.

Flash and runners that are removed from die-castings are not used to supply the melting pot at the die-casting machine, but are returned to the foundry for remelting and re-alloying. This procedure insures against contamination and possible modification of the alloy being used at the die-casting machine.

In the construction of all dies, whether for short or long run production, a policy of using only the highest grades of tool steels is followed. Experience has indicated that predictable performance in regard to heat checking, fatigue, wear resistance, and other important factors which influence die life cannot be found in the lower cost steels. Of the steels suitable for use in making dies, those selected to construct die-casting dies for aluminum do not contain tungsten since this element has a tendency to dissolve in aluminum. Eventually the dissolving action would cause pitting of the die surface and, consequently, of the die-casting. The die steels used almost exclusively in building dies are of the following typical composition: Chromium, 5.25 per cent; vanadium, 1.0 per cent; carbon, 0.35 per cent; manganese, 0.35 per cent; silicon, 1.1 per cent; and molybdenum, 1.2 per cent.

If the steel block from which the die is to be constructed has any voids, inclusions, or other

Fig. 4. This die, used to produce the die-casting shown in Fig. 3, has a back-up pad located behind the center of the die cavity. The pad prevents deflection of the die which would otherwise be caused by the high locating pressures required to hold the die halves together.

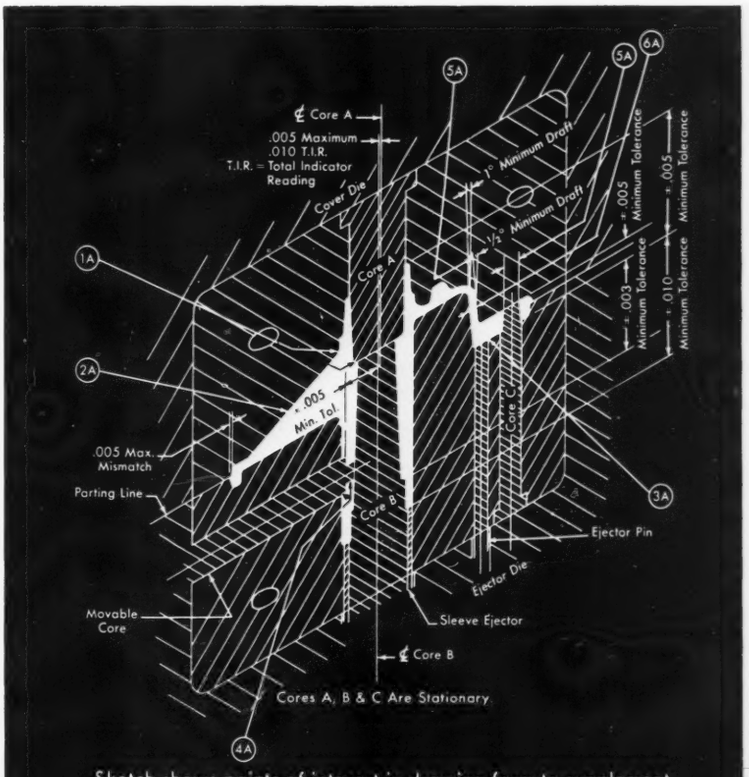
Aluminum-Base Die-Casting Alloys

Manganese, Maximum	Zinc, Maximum	Nickel, Maximum	Tin, Maximum	Balance, Maximum	Yield Strength, Pounds per Square Inch	Tensile Strength, Pounds per Square Inch	Elongation in 2 Inches, Per Cent	Charpy Impact Test, Foot-Pounds
0.3	0.5	0.5	0.1	0.2	14,000	30,000	7.0	4.5
0.3	0.5	0.5	0.1	0.2	18,000	37,000	1.8	2.0
0.3	0.5	0.5	0.1	0.2	16,000	35,000	3.5	...
0.5	1.0	0.5	0.3	0 5	22,000	40,000	3.0	2.5
0.5	0.6	0.5	0.3	0 5	20,000	35,000	3.5	3.0
0.5	0.6	0.5	0.3	0.5	25,000	45,000	3.0	3.5
0.5	1.0	0.5	0.3	0.5	.....	43,000	2.0	3.2
0.3	0.5	0.5	0.1	0.2	20,000	40,000	4.5	4.2
0.3	0.5	0.5	0.1	0.2	23,000	42,000	1.8	2.7
0.3	0.1	0.1	0.1	0.20	23,000	42,000	7.0	...
0.05	0.1	0.05	0.05	0.15	20,000	40,000	4.0	...
0.5	0.5	0.5	0.1	0.2	25,000	32,000	2.0	2.5
0.3	1.8	0.5	0.3	0.3	.....	32,000	1.5	2.0

forms of porosity in the vicinity of the die cavity, the die may fail in operation due to stress concentration or it may not be possible to clean up the die cavity so as to eliminate the defect. If a void were to be found in the cavity when the die was nearly completed, scrapping of the die and starting over would most likely be required. For this reason, a standard inspection procedure is followed whereby each block of die steel is sent to the laboratory for inspection before being used for die work.

With a Reflectoscope it is possible to accurately determine the location of all voids within the block and to plot the location of these defects on a chart. The chart is kept with the block to which it applies, so that in choosing a block for a particular die, one which does not have voids in the vicinity of what would become the cavity surface can be selected. In addition to saving many man-hours of labor, this procedure makes it unnecessary, usually, to return a block to the mill because of a minor defect since, in most cases, flaws are so located that the die cavity of some die to be constructed will permit use of the block.

The design of parts which can be successfully die-cast requires, in general, that the designer be aware of



Sketch shows points of interest in drawing form to supplement hints given above.

1a Use fillets and radii wherever possible, prevent sharp corners.

2a Use ribs for strength and rigidity.

3a Endeavor to place ejector pins on surfaces which will be machined or where flash removal will not be necessary. Hand removal of ejector flash is costly.

4a Avoid undercuts that require movable slides or loose cores.

5a Liberal draft allowances on castings and cores contribute to savings in cost of die casting.

6a Minimum wall thickness of 0.062 for aluminum and 0.045 for zinc for small castings. This is not an absolute value and is bound to be affected by actual design of the part.

Fig. 5. Diagram which illustrates some of the important principles of good die-casting and die-casting die design.

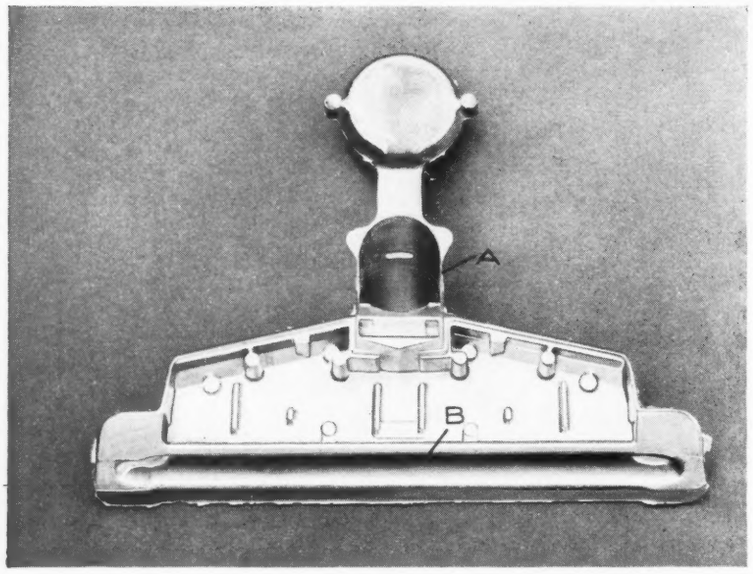


Fig. 6. The cavities (A) and (B) in this vacuum cleaner nozzle require the use of two relatively large cores moving at an angle.

certain limitations of the die-casting process regarding tolerances, wall thicknesses, core sizes, etc. Some of the important limitations which affect the design of the dies and die-castings are as follows:

The minimum draft required is 1/2 degree for outside walls and 1 degree for inside walls. Cores from 1/8 to 1/4 inch in diameter require 0.020 inch draft for each inch of length for aluminum cores, and 0.016 inch draft for each inch of length for zinc cores. Cores from 1/4 to 1 inch diameter require 0.016 and 0.012 inch draft per inch of length, respectively, for aluminum and zinc cores.

The minimum tolerance required is $\pm$ 0.003 inch for the first inch and $\pm$ 0.001 inch per additional inch for aluminum castings. For zinc castings, the minimum tolerance required is $\pm$ 0.002 inch for the first inch, and $\pm$ 0.001 inch per additional inch. Moving die parts affect the casting tolerance, and 0.010 inch should be added to any tolerance that depends on a relationship between moving parts, such as across the parting line, or where one surface is formed by the cover die and another surface by a movable core or slide. The flatness of a surface should be within 0.0015 times the longest dimension of the flat surface.

For small castings, the minimum wall thickness should be 0.062 inch for aluminum and 0.045 inch for zinc castings. Cores should have a minimum diameter of 5/32 inch for aluminum and 1/8 inch for zinc. The maximum depth of cored holes should not exceed four times the diameter of the hole.

When machining is necessary, an allowance of 0.010 to 0.020 inch over the final dimension should be left to give a definite cut for the tool. Standard tools and cutters can be used quite satisfactorily, but greater speeds and better finishes can be obtained with the use of larger rake and clearance angles.

Some of the principles of good die-casting design are shown diagrammatically in Fig. 5. Several dies built by Hoover for use in the manufacture of die-castings are here described.

Segmental Die for Producing High-Speed Fan

Since the vacuum cleaner fan shown in Fig. 1 is to revolve at high speed, each blade must contain the same amount of material symmetrically distributed about the center hole. Otherwise, unbalanced rotational forces would produce destructive vibrations in the final assembly. To insure even distribution of the metal, the two-cavity die for this part was designed and constructed as shown in Fig. 2, using twelve identical inserts fastened in a soft die-block. These easily made inserts not only provided the required symmetry, but also reduced construction costs and permitted easy replacement of worn segments.

Another requirement for this part was that the casting be of high density with minimum porosity at the periphery. By providing a "safety edge" or flash seen at *A*, Fig. 2, porosity was eliminated. The safety edge consists of a circular depression about 3/8 inch wide and 0.010 inch deep running around the periphery of the fan impression in the cover half and ejector half of the die. During the casting, an excess of metal runs off into this depression, providing uniform flow around the periphery. The flash also provides a surface against which the twelve ejector pins *B* bear when the part is ejected from the die. The flash and hence the marks left by the ejector pins are later removed in a trimming operation. Four vents *C* and run-off pockets are provided

for each cavity, and the die is amply water-cooled, the water entering and leaving the die through pipes *D*.

Reinforcement of Dies to Prevent Bending

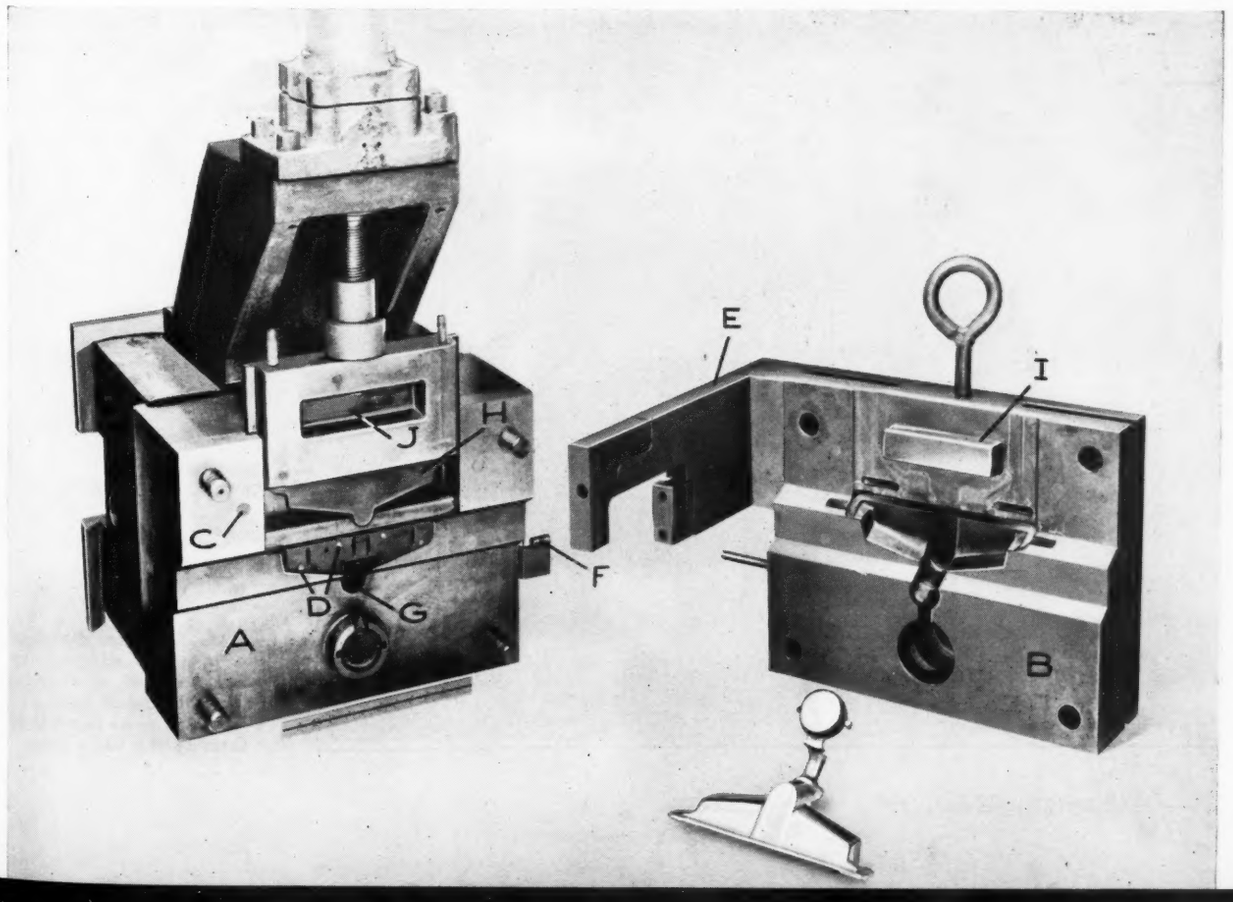
The typewriter base shown in Fig. 3 does not present any unusual problems in die-cavity or core design. However, due to the large projected area of this casting at the parting line, the locking pressure required is so great that the ejector die for this part, Fig. 4, would bend much in the same manner as a beam simply supported at both ends, since the ejector box *A* does not bear uniformly over the back surface of the die *B*. To overcome this bending action and the resulting distortion of the casting, the center portion of the ejector die was designed with a rectangular back-up pad located behind the center of the die. This pad, in effect, distributes the locking pressure in a manner analogous to a beam supported at three points, and reduces the deflection of the die by more than half. Without the use of the back-up pad, the dimensional variations across the width of the casting would be so great as to prevent proper assembly of the typewriter base with the frame of the typewriter.

The vacuum cleaner rug nozzle shown in Fig. 6 requires the use of two relatively large movable cores to produce the cavities at *A* and *B*. The die for this part is shown in Fig. 7. Accurate timing of the core pulling and ejection of the part from the die is essential if broken ejector pins and cores are to be prevented. The operating cycle for this die is as follows: (1) The ejector die *A* advances toward cover die *B* and the four safety pins *C* press against the cover die surface, causing the ejector pins *D* to be retracted in the ejector die. (2) The overhanging arm *E* on the cover die, advancing against the rack extension *F* on the ejector die, causes the pinion-actuated core to move forward through the opening *G*. (3) Core *H* is moved down hydraulically and as *A* continues to move toward *B*, the core lock *I* engages opening *J* securely, thus locking the core in place.

In producing this die-casting, it is essential that any flash resulting from the shot be located so that it can be removed without producing any bumps or rough areas in the surface. Accordingly, the parting line was located so that any flash produced would run along the outside edges of the casting where it could be easily removed. As may be seen in the illustration, the parting line approximates a *Z* shape.

In the second article, the use of large cores moving at an angle to produce a completely cored casting will be described. In addition, a description of a die with offset cores and one with rack-and-pinion-actuated cores will be given.

Fig. 7. Die used to produce aluminum die-casting seen in Fig. 6. The cores which produce cavities (A) and (B) in Fig. 6 are shown in the retracted position. Core (G) (not visible) is rack-and-pinion-operated, and core (H) is hydraulically actuated.



Sheet-Metal Forming without Vertical Press Movements

By GILBERT C. CLOSE

BACK in 1935, a radical change in sheet-metal forming practice took place at the Douglas Aircraft Co., Santa Monica, Calif., with the adoption of the Guerin rubber-pad process, which was named after the Douglas tool engineer who conceived it. The process uncovered many new possibilities for shallow forming on heavy hydraulic presses. Now, another rubber-pad process has been developed by a Douglas tool engineer, O. A. Wheelon, which is performed on a comparatively light press through the use of an inflatable rubber bag.

The new process also employs a "direct-acting" hydraulic press, but this press is of a horizontal construction and the hydraulic pressure in forming is confined entirely to the rubber bag. The press is only about one-tenth the size of a comparable press required for the Guerin process, yet is capable of delivering up to three times the pressures currently used for this type of work. The sizes of the presses used in both processes are compared in Fig. 1. Higher pressures are available with the Wheelon process which make it possible to form the heavier-gage metals found in modern high-speed aircraft, and give the additional advantage of reducing subsequent hand-forming operations by some 50 per cent.

The new press, officially designated as the Wheelon direct-acting hydraulic press, employs simple inexpensive form blocks, or male dies. These blocks are placed at random on the press bed with the sheet-metal blank superimposed. A large rubber pad is then squeezed down and against the blank, forming it to the contours of the die.

The important distinction between the Guerin and Wheelon processes lies in the method by which the necessary forming pressure is obtained. In the former process, the rubber pad and form blocks are brought together mechanically by the movement of the press ram. In the latter process, a rubber bag nested in the press body just above the pad is inflated with hydraulic fluid. Expansion of this pressure bag forces the pad downward against the part to be formed. This action is shown diagrammatically in Fig. 2.

It will be noted also from the diagram why the new press is called "direct-acting." Pressure exerted by the inflated bag continues to act directly against the pad, regardless of the contours

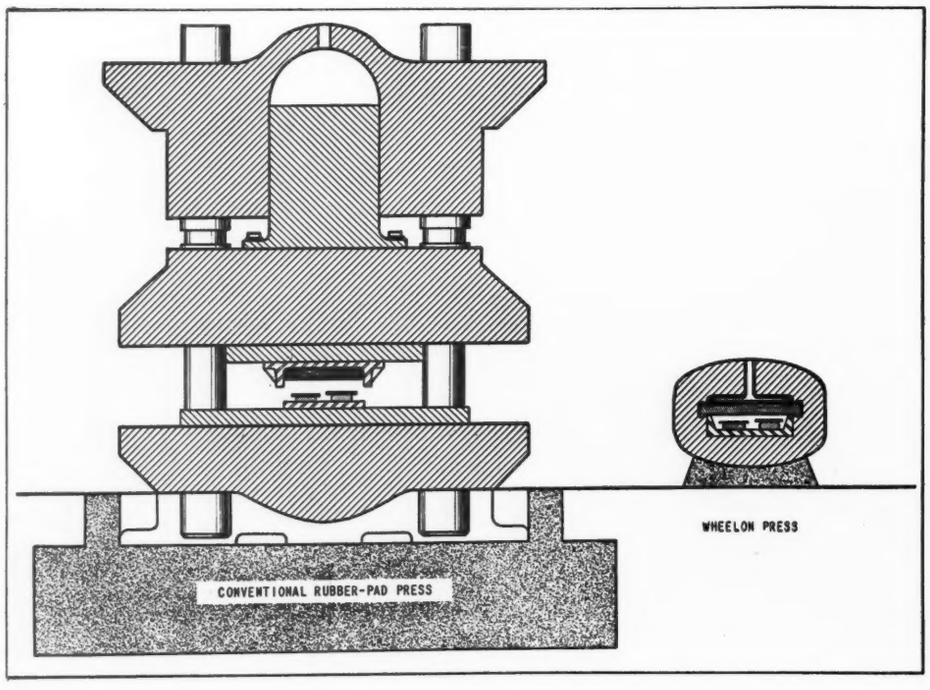


Fig. 1. Sectional drawings illustrate the comparative proportions of a conventional rubber-pad press and a Wheelon press capable of forming the same part.

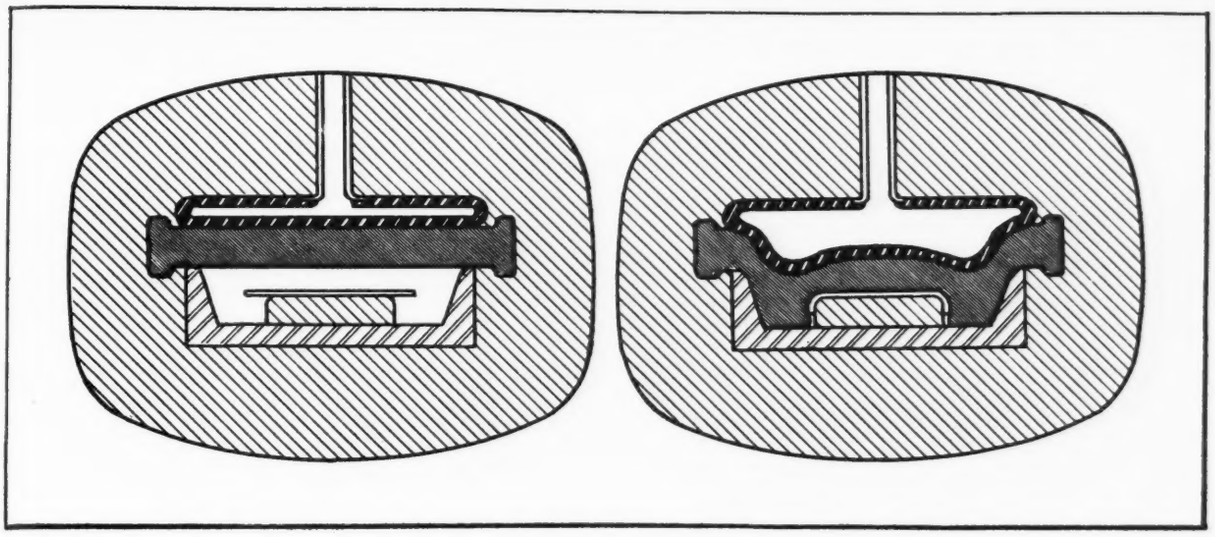


Fig. 2. Bag action of the Wheelon process. (Left) Bag is collapsed, throw pad is straight, and work blank rests on top of the form block. (Right) Bag is inflated and throw pad is pushed down to bend blank around block.

assumed by the pad from the underlying form blocks. A good flange formation is obtained, very little hand-forming being necessary. With conventional press equipment, side pressures are developed solely from the compression of the pad.

A pilot model Wheelon press, shown in Fig. 3, is now being used in production at the Douglas plant, operating at 5000 pounds per square inch, and applying a total load of 2500 tons on a 20- by 30-inch platen. As can be observed in the illustration, the press is relatively simple to build and requires no critical materials. There are no moving parts except two work-tables. Only a small floor area is required, and pre-installation work consists simply of a cement foundation to support the press at a convenient operating level. Ordinary head-room is sufficient. In Fig. 4 is illustrated a typical heavy-gage metal part formed on the press, and in Fig. 5 is a close-up view of the flange on this part, showing how effective the side pressure has been.

A softer forming pad (approximately 35 Shore hardness) is used in the Wheelon than in the Guerin process (approximately 60 Shore hard-

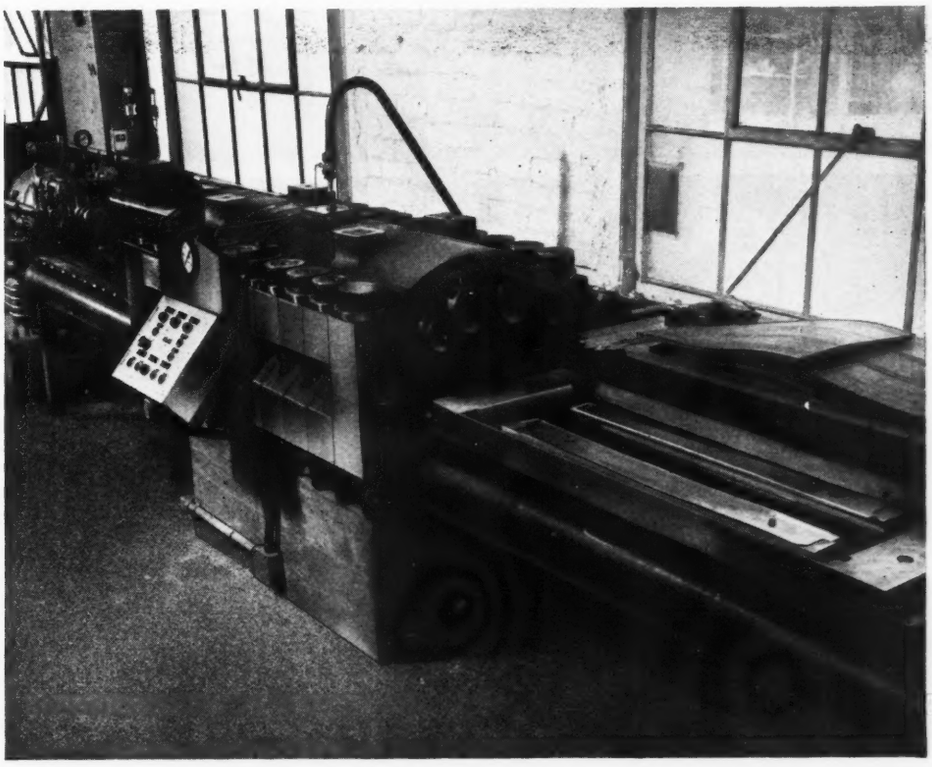


Fig. 3. Pilot model of the 2500-ton Wheelon press now in use at Douglas Aircraft. Press body consists of a simple series of arch-like segments.

Fig. 4. Heavy-gage part formed on the Wheelon press. (Top) Work blank of 75S aluminum alloy, 0.25 inch thick. (Upper center) Kirksite form block. (Lower center and bottom) Views of part after forming

Fig. 5. Close-up view of formed part in Fig. 4, which shows how effective side pressure of the Wheelon process creates the double brake of the flange, considerably reducing subsequent hand-forming

Fig. 6. View shows operator arranging blanked strips over form blocks prior to indexing table to forming position. Control panel is visible on operator's left.

Fig. 7. A centralized panel facilitates entire press operation through interlocking controls. Simple metal inserts in the press body provide for convenient replacement of the bag.

ness). This feature permits more effective application of the direct-pressure principle. Not shown in either of the diagrams of Fig. 2, but used in both the Guerin and Wheelon processes, is a hard rubber throw pad which is inserted between the forming pad and the work. A relatively hard throw pad (approximately 70 Shore hardness) is used in the Wheelon process.

The development of a satisfactory hydraulically inflatable pressure bag was a rather difficult problem. The bag now in use has proved serviceable, but undoubtedly will need periodic replacement. Bags are fairly inexpensive and can be installed in a couple of hours.

The power unit of the prototype press consists of a high- and a low-pressure pump driven by a 30-H.P. induction motor which operate together to fill the bag during the pressure cycle. On reaching a predetermined point, the pumps are automatically shut off, and the pressure in the bag is relieved through a surge valve for a short time interval, after which the low-pressure pump withdraws the remaining oil and lifts the bag and pad. A vacuum switch is actuated when the bag is lifted clear to energize the table circuit. The table is also powered by the low-pressure pump.

The press has two tables, which are alternately indexed between forming and serving positions, thereby providing practically continuous production. In Fig. 6 is shown the loading of blanks over form blocks on one of the tables. All electrical controls for the hydraulic system are compactly arranged at a central panel, seen in Fig. 7. An electric interlock prevents the bag from being inflated before the tables are properly indexed, and prevents the tables from being moved unless the press is under vacuum. In addition, the interlock makes it impossible for the two tables to collide.

The Douglas Aircraft Co. has licensed the Verson Allsteel Press Co., Chicago, Ill., to manufacture and market the Wheelon press. Models will be available with either one or two tables.

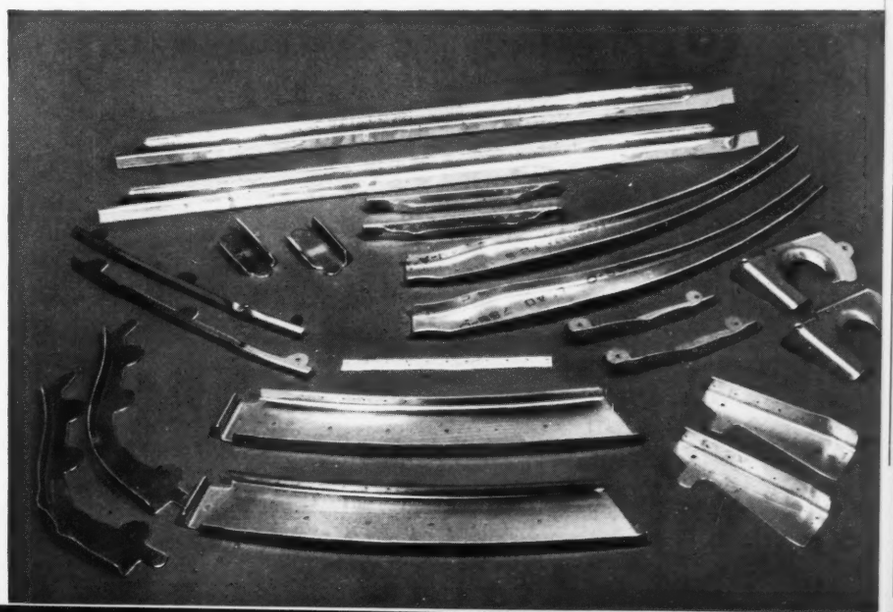


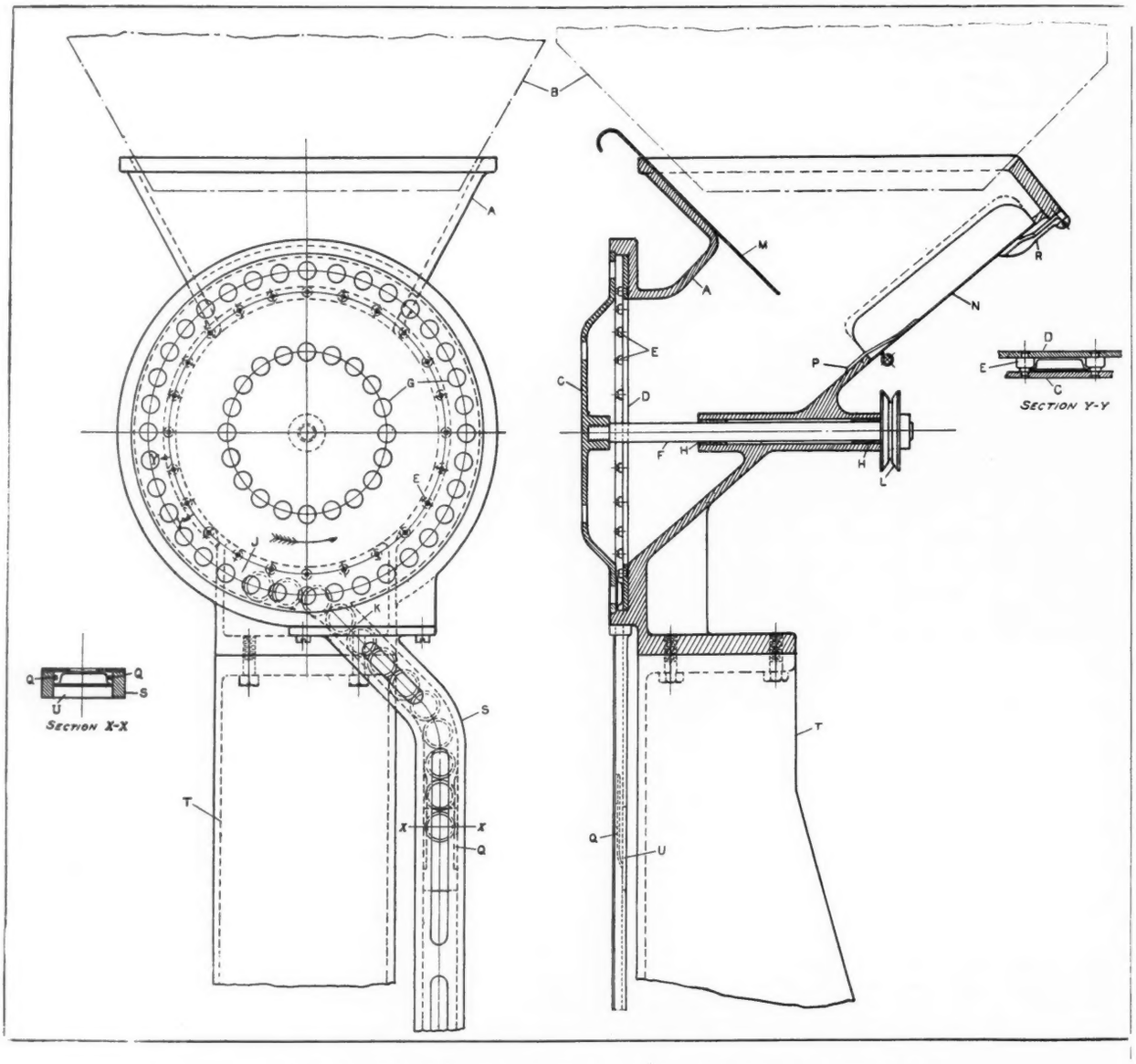
Fig. 8. Collection of pairs of representative aircraft parts, one of each pair being formed by the Guerin process, the other by the Wheelon process. Close inspection shows superior flange detail obtained on parts formed by Wheelon process.

Hopper Feeds for Bottle Caps

Improved Hoppers and Feeding Mechanisms for Providing a Continuous Flow of Bottle Caps to Machines Have Been Developed to Meet the Needs of a Rapidly Expanding Industry — First of Six Articles

By JOSEPH and VINCENT WAITKUS

BOTTLE cap manufacturing machines and bottling equipment are among the most essential elements of the brewing industry. Remarkable progress has been made in the development of these elements along lines intended to increase production and achieve automatic operation. The hopper feed requirements of the bottle cap manufacturing machines and the bottling machines are very much alike and present designing problems requiring much the same treatment. It is the purpose of the authors of this series of articles to describe the various types and forms of hopper feeds most generally used and to point out the particular



Hopper feed designed to deliver bottle caps to machine, all with the same side up

advantages and disadvantages of each individual design.

The word "hopper" suggests simply a deep receptacle or container for holding a supply of caps for the machine. However, there are many details connected with these hoppers that make them more than a simple receptacle. The most important of these details is the mechanism for arranging the caps so that they will all be face up or all face down, depending upon the kind of machine under consideration. In the bottle cap manufacturing machine, the caps are generally delivered face up, while in the bottling machine, they are usually required to be face down.

The ordinary bottle cap is usually made of sheet tin of a relatively thin gage and can be distorted under light pressure. It is provided with a cork disc, retained in place by an adhesive such as gutta-percha or albumen. An appropriate design is usually lithographed on the top of the cap. Therefore, any device that handles the caps must be so designed that it will not disturb or mutilate the lithographed design.

The general construction of a so-called "pin rectifying hopper" for delivering the caps to a machine in an orderly manner, all with the same side up, is shown in the accompanying illustration. The chute *B*, shown by the dot-and-dash lines, supplies caps to the main hopper *A*. The plate *M* serves as a means of checking the flow of caps, in case too large a quantity is placed in the chute. A clean-out door *N* is provided, which is held in place by clip *P* and latch *R*. The rotating member consists of the dish-shaped plate *C* and the ring *D*, which are held together as a single unit by the pins *E*. The ends of these pins are riveted over, as shown in the enlarged section *Y–Y*. The rotating member is fastened to the shaft *F*, supported in bearings *H*, and is kept in continual rotation by a belt drive to the pulley *L*. It is desirable to have a minimum amount of clearance between the ring *D* and the hopper *A*. A large number of holes *G* are provided in the plate *C* and slots are cut in the cover of chute *S* for the purpose of observing the movement of the caps. The entire hopper is supported by column *T*.

When the caps fall into hopper *A*, they are kept in a state of continual motion by the pins *E*. From section *Y–Y* it will be seen that the caps can pass between the pins *E* only when they are in one position. It is, therefore, the purpose of the rotating member to keep the caps in motion until they are so positioned that they will pass between the pins to the chamber *J*. From this chamber the caps fall into the slot *K* and thence down the chute *S*, which feeds them into the machine in an orderly manner.

As a precaution, chute *S* is provided with a safety slot which prevents any cap that may fall in the wrong position from passing to the machine below. The safety slot is shown in section *X–X*. It consists of two ribs *Q*, which hold the cap in the chute if it is in the proper position, or permit it to drop out of the chute through the opening *U* if the position is reversed. This safety device becomes effective when a cap is crushed, so that it passes between the pins *E* to chute *S*.

The main advantage of this arrangement is its simplicity. Its few operating parts and low construction cost make it very desirable from the manufacturing point of view. On the other hand, the rotating member causes the caps to turn around in the hopper and often results in scratching the lithographing. This condition is aggravated by excessive pressure when there is no automatic action available for regulating the quantity of caps admitted to the hopper. Therefore, the main disadvantage is in the churning action, coupled with excessive pressure, which results in serious abrasion and scratching. The double-disc type of rectifying hopper, representing a further advance in cap feeding equipment, will be described in a succeeding article.

* * *

Photometric Method Quickly Determines Copper Content of Steel

To conserve costly and scarce alloying metals, many high-strength structural steels now being prepared in compliance with national emergency specifications utilize the alloy content of the scrap used in the steel-making process. This requires rapid methods of analysis, so that the composition of the steel bath can be determined and necessary adjustments in composition and treatment can be planned during the melting period.

One of the elements frequently used as an alloying constituent is copper, both to increase the strength of the steel and to improve its resistance to atmospheric corrosion. Though accurate chemical methods are available for the determination of copper in steel, a rapid, one-step procedure has been lacking. This need now has been met by a photometric method developed at the National Bureau of Standards.

The method involves dissolving the steel sample in certain acids to form a copper complex, which is extracted and stabilized. The optical absorbency of the complex is measured in a colorimeter, and the amount of copper is read from a calibration curve or table. Average values obtained for samples containing from 0.05 to 0.25 per cent copper were within 0.005 per cent of the certified value.

Mass Production of Standard

FABRICATION of standard carbide tools on a mass production basis requires modern plant lay-out and materials-handling techniques, controlled inventories, special high-production machine tools, precision production operations, and 100 per cent inspection. In the new fabricating plant of the Carboloy Department in Edmore, Mich., roller conveyors, as shown in Fig. 1, carry the tools through the complete process of cutting off, milling, brazing, grinding, inspecting, and painting. The tools are grouped in wooden boxes which protect them from damage as they move from operation to operation on the roller conveyor.

A large inventory of bar stock for the tool shanks is stored by sizes. The bar stock is degreased and weighed before starting the cut-off operations. These are performed in two steps. First, the bar stock is cut into double-length shanks on abrasive cut-off machines. Then they are cut in half on a similar machine, Fig. 2, but with the shanks held at an angle to provide the correct relief on each tool.

The tool shanks next move to the milling department, where milling machines are grouped on each side of the roller conveyor. Here the shanks are provided with the correct side clearance, side rake, end cutting edge, and back rake angles. Also, recesses for the carbide tips are milled, three at a time, in the set-up seen in Fig. 3. Gang milling techniques are used throughout the milling department, and many of the machines are provided with auxiliary devices that speed the cutting operations by avoiding hand feeds.

Large inventories of finish-milled tool shanks are maintained to facilitate quick delivery of standard tools. By so doing, quantities of tools can be delivered to a customer in a short time by merely brazing on the desired carbide tips and sharpening the tools. Shanks taken out of stock are conveyed to a sand-blasting machine, Fig. 4, where the milled recesses are cleaned preparatory to the brazing operation. After sand-blasting, the shanks move along the conveyor and are stamped on a marking machine to identify their standard shapes, and the size and grade of carbide that will be brazed to the shanks.

The next operation along the conveyor is the application of flux, brazing strip, and carbide tip on the tool shank by hand, as seen in Fig. 5. The silver-solder brazing strip is blanked from strip stock on a punch press. From this point the tools move to a high-frequency induction heat-

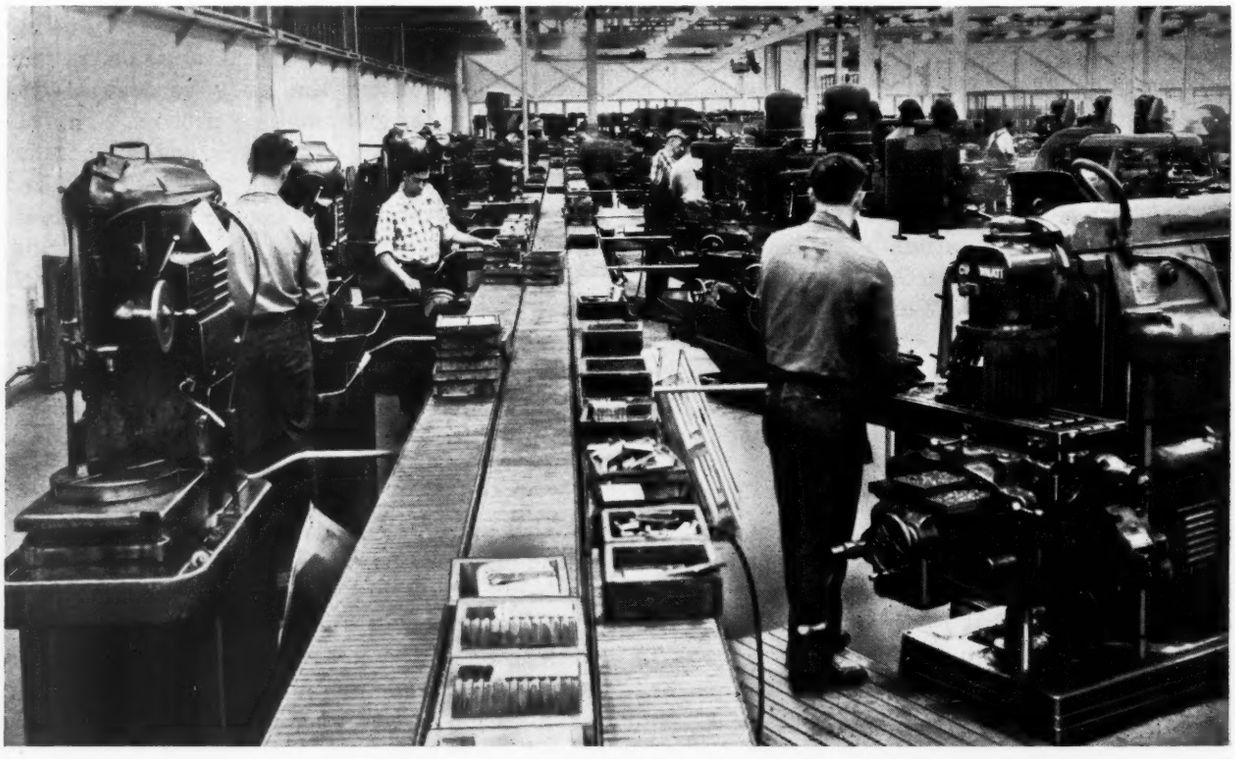


Fig. 1. Wooden boxes containing shanks for carbide tools pass along roller conveyor lines in the milling machine department.

Carbide Tools

Economy, Quick Delivery, and Uniformity are Three of the Main Factors that Have Gained Wide Acceptance for Standard Carbide Tools in Metal-Working Plants. Here is How Carboloy Department of General Electric Co. Uses Mass Production Techniques in its New Edmore, Mich., Tool Fabricating Plant to Fulfill These Requirements

ing machine, in which the carbide tip is brazed to the shank.

After the brazing operation, the tools move to a grinding department in which the machines are grouped along each side of the roller conveyor, as in the milling department. In this department, the shanks are first cleaned up on a grinding machine equipped with an aluminum oxide abrasive wheel. Next the tips are semi-finish sharpened on a double-end, carbide tool grinding machine equipped with a silicon carbide abrasive wheel, Fig. 6.

Finish-sharpening is done on a special Carboloy-developed machine, Fig. 7, in which a diamond wheel rotates in a horizontal plane. This machine enables a tool to be loaded in one holder while another is being ground. The nose radius on the tools is ground on another machine, equipped with a silicon carbide wheel. Following the grinding operations, the tools are given 100 per cent inspection. Points especially watched for in the inspection operation are the presence of grinding checks, the correctness of the tool identification, and the size of the nose radius.

The tool shanks are then dip-painted in a spe-

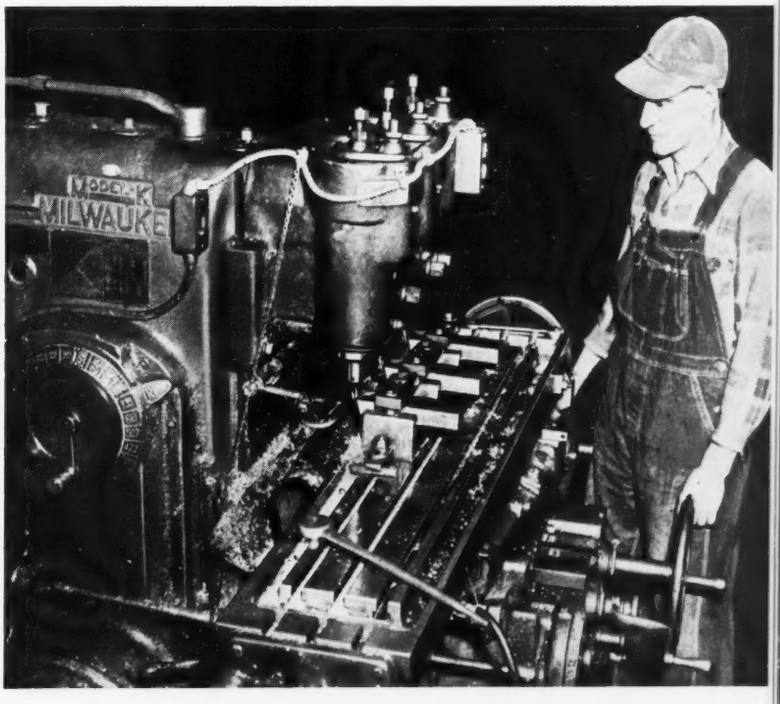


Fig. 2. (Above) Double-length shanks are split in half on this abrasive cut-off machine. The shanks are held at an angle to obtain the correct relief.

Fig. 3. Recesses for the carbide-tipped inserts are cut in the tool shanks, three at a time, on this three-spindle milling machine.

Fig. 4. Milled recesses in the tool shanks are cleaned by this sand-blasting machine preparatory to brazing the carbide tips in place.

Fig. 5. Silver-solder brazing strips (blanked from strip stock on a punch press), flux, and carbide tips are assembled in the tool shank recesses by hand.

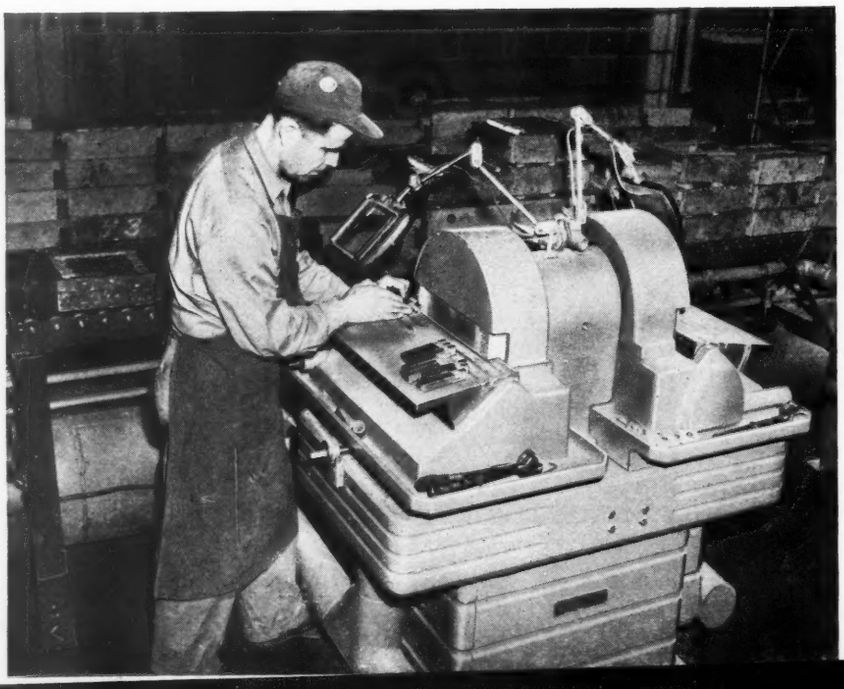


Fig. 6. A double-end tool grinding machine is employed to semi-finish sharpen the carbide tools. A silicon carbide abrasive wheel is used in this operation.

Fig. 7. Finish-sharpening of the carbide tip is done with a diamond wheel rotating in a horizontal plane on this Carboloy-developed machine.

cial continuous rotary machine (Fig. 8), also developed by the Carboloy Department, for further identification and corrosion resistance. Aluminum paint is applied on tools to be used for machining non-ferrous materials and cast iron. Orange paint indicates a steel-cutting grade tool. After painting, the ends of the tools are dipped in a plastic solution to protect the carbide tip from damage during handling and storage. The finished tools are then packaged for shipment.

The roller conveyor line along which the tools are moved is U-shaped. The shipping and receiving department is located in one end of the plant to provide minimum materials-handling problems. The grinding department is located along one side of the plant, and the brazing and milling departments along the other side. Shank storage is at the opposite end of the plant from the shipping department. The milling, grinding, and brazing departments are under the supervision of individual foremen, all of whom are responsible to a general foreman.

Expansion of Metals Measured within 0.00005 Inch

Progress has been made in the minute measurement of expansion caused in metals by temperature changes. Results of a study made along these lines are proving useful in the production of aircraft engines and other power plants that have infinitesimal tolerances in their moving parts. A paper recently presented before the American Society for Metals described newly developed "dilatometers," which measure dimensional changes of aircraft engine metals to 0.00005 inch.

With these instruments, dilatometry has been extended to temperatures far in excess of the previous practical limits of 1800 degrees F., and heating rates of 500 degrees F. per second are readily attainable. Temperatures and resulting dilations are recorded by means of thermocouples and clip gages, affixed to the specimens and connected to high-speed response-recording instruments.

Fig. 8. A continuous, rotary machine is employed to dip-paint the carbide tool shanks—aluminum identifying non-ferrous and cast-iron tools, and orange, steel-cutting grades.

Machine Tool Builders Discuss

STEPS that should be taken to insure a strong machine tool industry, both in times of peace and national emergencies, were the topics under consideration at the fiftieth spring meeting of the National Machine Tool Builders' Association held at the Edgewater Beach Hotel, Chicago, Ill., from April 30 to May 2, inclusive. In his opening address "Let's Define Our Objectives," Frederick S. Blackall, Jr., president of the Association and president and treasurer of the Taft-Peirce Mfg. Co., referred to the pressing problems confronting the machine tool industry, and then outlined a long-range program comprising eight objectives for promoting a greater measure of stability for the industry. The objectives of this program are referred to in the editorial which appears on page 145 of this number of MACHINERY.

Mr. Blackall also discussed, at considerable length, the effect of foreign competition on the domestic market and the handicaps American machine tool builders experience in trying to hold their markets abroad. The situation may have a serious lasting effect on future export business of the industry.

Necessity for a Good Public Relations Program

In his paper "The Role of Public Relations in a Defense Economy," William L. Dolle, chairman of the Committee on Public Relations and president of the Lodge & Shipley Co., referred to the desirability of informing government officials and citizens in general concerning the importance of the machine tool industry in our national economy.

Mr. Dolle announced that the machine tool industry is establishing a speakers' bureau through which executives of the industry can be made available as speakers before service clubs, schools, business and civic organizations, and similar groups.

Frank W. Pensinger, chairman of the Committee on Advertising and advertising manager of the Monarch Machine Tool Co., in his paper "Advertising Can Help" elaborated upon the necessity of public relations, and described the activities of his Committee. Mr. Pensinger pointed out the low cost of advertising in magazines. When a calculation is made of the cost per reader in comparison with the cost of salesmen's visits on prospects, he figured that whereas the average cost of a personal call is $19, the average cost of reaching a prospect through an advertisement in a technical magazine or trade journal amounts to only 1.3 cents. He pointed out the fallacy of doing business on a "mouse trap" theory.

The Defense Program Discussed in a Panel Session

One of the features of the meeting was a panel discussion of the defense program by chairmen of sub-committees of the Committee on Government Relations. The chairman of the main committee, M. A. Hollengreen, president of the Landis Tool Co. and the Gardner Machine Co., referred briefly to points which were then discussed in detail by the chairmen of the sub-committees. Everett M. Hicks, acting chairman of the Sub-committee on Procurement Policy and vice-president and manager of the Grinding Machine Division of the Norton Co., stated that according to the last estimate obtainable from the National Production Authority, gross new orders for machine tools this year will amount to approximately $1,000,000,000. The figure for the first quarter of the year was $294,000,000, which is at an annual rate of $1,176,000,000. However, cancellations during the first quarter totaled about $100,000,000—or over 30 per cent of the new orders placed for the three months.

Mr. Hicks stated that since early February, the General Services Administration has been drafting a new set of terms to be offered to all machine tool builders who have pool orders. The terms are intended to eliminate some of the objections which companies have raised to the present contract form. He outlined terms that will probably be changed and mentioned those that are almost certain to remain unaltered.

Efforts Toward a More Realistic Tax Policy

In his paper "Tax Policy," L. D. McDonald, chairman of the Sub-committee on Tax Policy and executive vice-president of the Warner & Swasey Co., described the efforts made to obtain a more realistic depreciation policy from the Bureau of Internal Revenue; relief in excess profits taxes; and more practical consideration of amortization certificates, plus an accordion privilege for certificates that are issued.

Mr. McDonald pointed out the damaging effect on modernization of metal-working plants which has resulted from the adoption of regulation TD-4422 by the Bureau of Internal Revenue back in 1934. The original purpose of this regulation was to enable the government to raise approxi-

Requirements for a Strong Industry

mately $9,000,000 in taxes for a period of three years. However, in 1948, the Treasury Department estimated that if it would recede from its stand on this regulation, it would cost the government $4,500,000,000. The harm to the national economy has probably been much greater because it has retarded the production of capital equipment and its products.

A Permanent Pool of Machine Tools for Defense Purposes

Herbert L. Tigges, chairman of the Permanent Defense Capacity Sub-committee and executive vice-president and sales manager of Baker Brothers, Inc., referred to the long time it took after the Korean conflict broke out to obtain official recognition of the fact that no matter how many machine tools there may be in this country, new weapons and a great increase in the production of military items in time of war always necessitate a large number of new machines. Many of these machines must be special—and they must be built, installed, and tooled up, and operators must be trained, before they can be used for the production of weapons. Simply buying up huge amounts of manufacturing equipment and storing it is not the answer to the problem. Mr. Tigges predicted that a central pool of machine tools kept up-to-date and made equally available to all defense contractors and sub-contractors in time of national emergency will, undoubtedly, be accepted as part of our nation's future program.

Foreign Competition at Home and Abroad

J. Herbert Myers, chairman of the Sub-committe on Overseas Markets and vice-president in charge of machine tool sales for the Lodge & Shipley Co., reported that his committee had been established to study government restrictions at home and abroad that are affecting export sales of machine tools, and secondly to study the impact of the importation of foreign machine tools on our domestic market.

The importance of export sales to the machine tool industry is demonstrated by the fact that during the lean years of the depression, foreign sales averaged better than 20 per cent of the total machine tool business. During the pre-war years of 1936 to 1939, which were lean years in the domestic machine tool business, foreign sales averaged 30 per cent of the total business, while in the years from 1938 to 1940, inclusive, foreign sales ranged from 40 to 44 per cent. In the immediate post-war years and through 1950, export sales were almost 30 per cent of the total industry volume. To many companies these sales meant the difference between profit and loss.

A disturbing fact is that new foreign orders have declined to an all time low of 4 1/2 per cent in February of this year due to the heavy demand for equipment in this country and the restrictions on sales abroad. This is a serious matter because distributor organizations which have been built up abroad during many years of mutually profitable relationships, cannot be supported at this time through sales of American machine tools. These distributor organizations should be kept intact for future years when the industry will again be in the position to ship large quantities of machine tools overseas.

Papers relating to the government price control policy and renegotiation were presented by Ralph J. Kraut, president of the Giddings & Lewis Machine Co., and A. J. Bryant, vice-president of the Cleereman Machine Tool Co., respectively.

One of the high points of the dinner meeting was the presentation of a silver bowl to Robert M. Gaylord, president of the Ingersoll Milling Machine Co., in commemoration of the fact that he served as president of the Association twenty years ago. The guest speaker at the dinner was Clay P. Bedford, who was until recently Assistant Secretary of War and who is now president of the Chase Aircraft Co.

* * *

Hydraulic Press for Producing Alloy Steel Shapes

Solid and hollow shapes of alloy steel, including tubes, will be produced by a hydraulic press built by the Lake Erie Engineering Corporation for hot-extrusion operations in the Watervliet, N. Y., plant of the Allegheny Ludlum Steel Co. The equipment is particularly interesting because it utilizes glass both as a lubricant and as an insulator. The press has a total working force of 1800 tons and accommodates billets up to 7 1/2 inches in diameter by 24 inches in length.

* * *

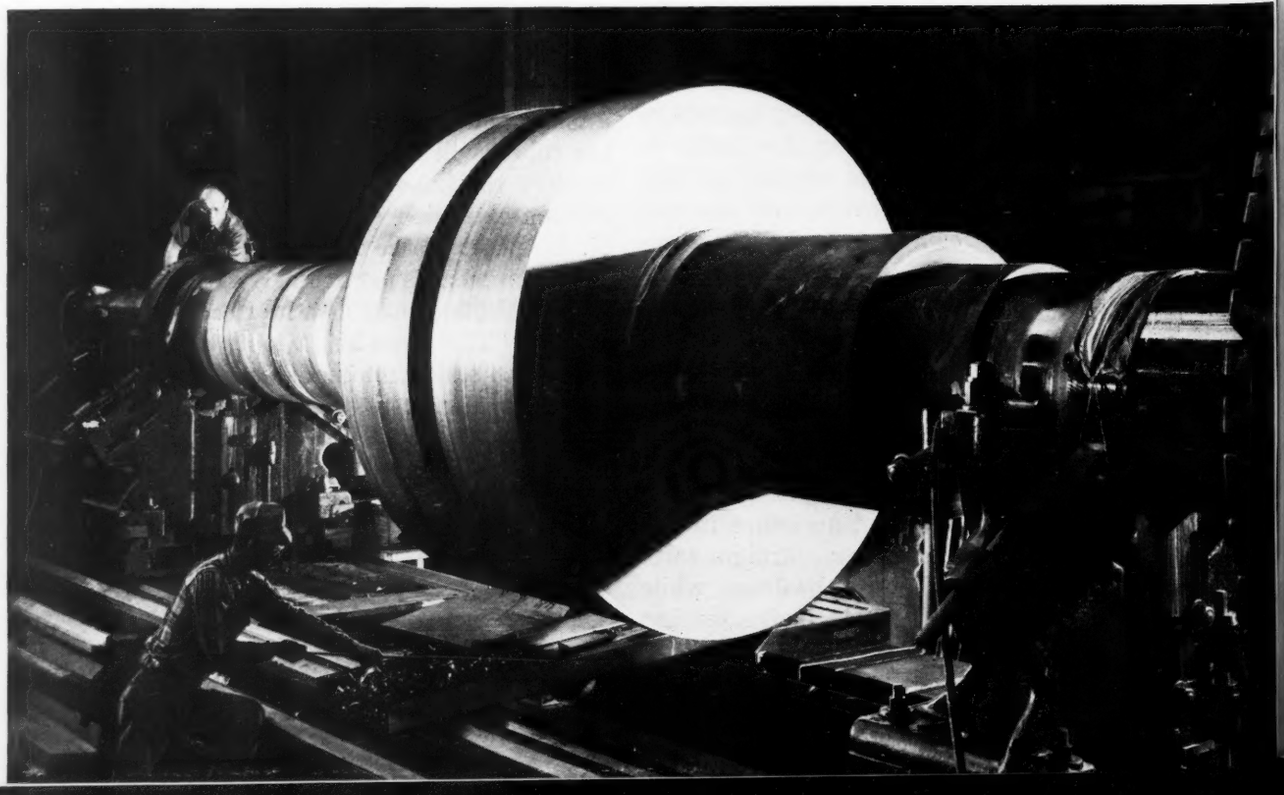
In 1942, the steel industry produced a total of 11,000,000 tons of plates for wartime use—enough to girdle the globe with a 9-foot band of steel 1/2 inch thick.

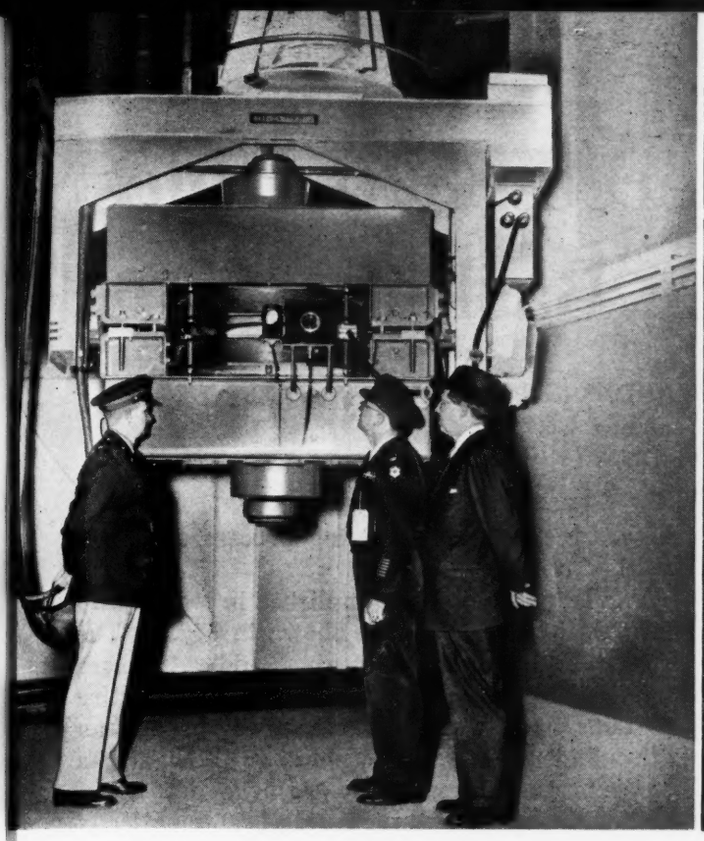
In Shops Around the Country

Camera Highlights of Some Interesting Operations Performed in Various Metal-Working Plants throughout the Nation

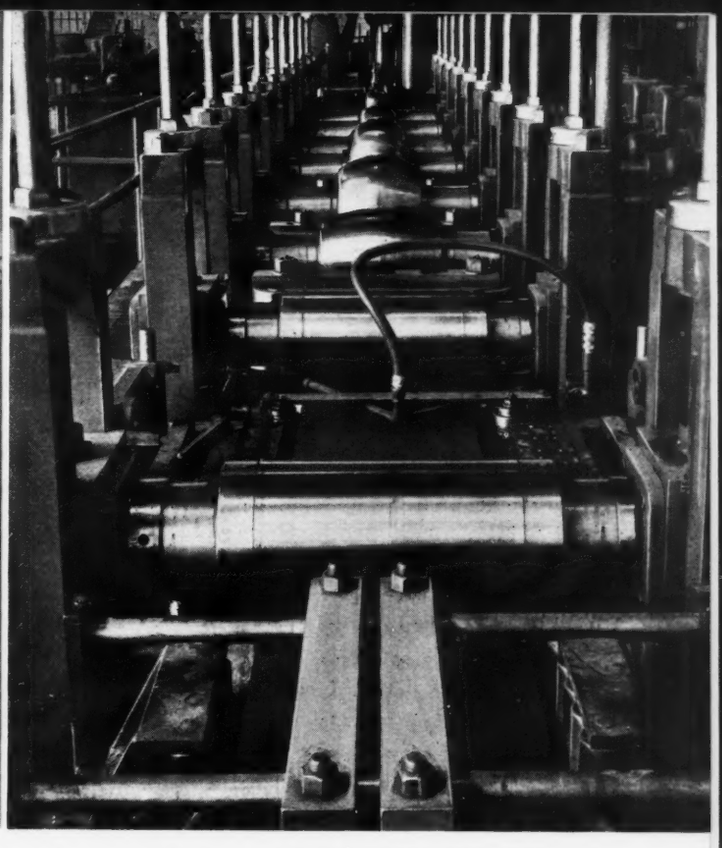
Performing a flexure test at an elevated temperature in the plant of the Ryan Aeronautical Co., San Diego, Calif. The test piece—a heavy aluminum spar—is set up in a Baldwin testing machine, with induction heating coils on each side of the bend point. Load is measured by a Tate-Emery machine.

A 78 1/2-ton low-pressure turbine spindle forging being rough-machined on a lathe at the West Allis, Wis., Works of the Allis-Chalmers Mfg. Co. Ingot originally weighed 185 tons. Center-section diameter of 85 1/2 inches and length of 26 feet 5 inches make it probably the largest and heaviest forging ever used for a steam turbine.



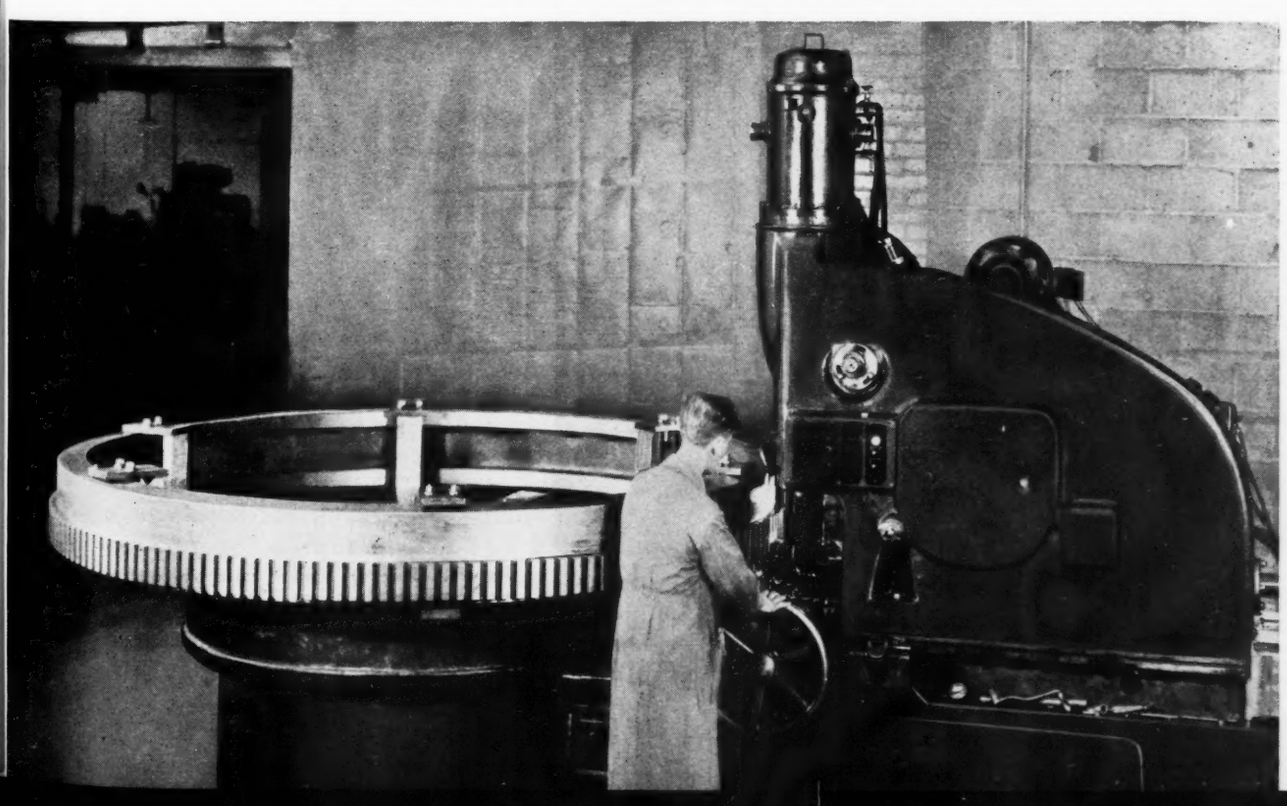


First industrial application of a 24,000,000-volt betatron X-ray unit speeds inspection of armor steel castings at the Commonwealth plant of General Steel Castings Corporation, Granite City, Ill. The massive instrument is powerful enough to penetrate 7 to 9 inches of armor steel in little more than a minute, providing a sharp X-ray photographic record for inspection use.



New steel processing mill converts coiled stock into rear-axle housings at the Ford Motor Co.'s Mound Road plant, near Detroit, Mich. Stock enters the loading end of the mill and is processed into a tubular shape by a series of rollers. After being automatically welded, the flash is removed and tubes are cut to desired length. Production rate is seventy-five housings per minute.

A 10-foot spur gear for a concrete mixer being cut on one of the largest Fellows gear shapers in the United States at the Brad Foote Gear Works, Inc., Chicago, Ill. The shaper was originally built to manufacture gears up to 100 inches in diameter, but has been redesigned to accommodate gears with diameters up to 152 inches.



Unusual Die Pierces 726 Holes in Spinner Baskets

By JOSEPH F. HOWARD, Vice-President
City Auto Stamping Co.
Toledo, Ohio

THE mass production of the automatic washing machine spinner basket shown in Fig. 1 presented several unusual problems to the City Auto Stamping Co., manufacturer of this stamping. One of the most challenging of these problems involved the piercing of 726 holes around the circumferential surface of the basket in such a manner as to assure the inner surface being completely smooth and entirely free of burrs or sharp edges. The situation was met by devising a method whereby these small holes, 5/32 inch in diameter, are pierced from the inside.

Drawing, forming, and piercing of other holes in the main body of the basket (which is 21 inches in diameter, 14 inches deep, and made from a 42-inch diameter blank of 18-gage steel) require eight stamping operations. Necking of the top requires one annealing and four curling operations performed on specially designed machines. All of these operations are performed before the side hole-piercing process described in this article.

Actual piercing is accomplished in twenty-two strokes in a single die, as shown in Fig. 2. The basket is placed on an indexing saddle *A*, where it is securely held in position during the entire piercing cycle by pressure applied through an air cylinder to a rubber cushion *B*. Each stroke of the press pierces a group of thirty-three holes, and, with each stroke, the basket is automatically indexed 16 degrees, 21 minutes, positioning it for the following stroke. A limit switch actuates the control which automatically stops the press on the completion of each twenty-two stroke cycle.

The ram *C* is so designed that on its downward stroke the cam *D* engages and moves the punch button retainer slide *E* into position against the outer surface of the basket. The ram *C*, in continuing its downward stroke, engages and moves the punch retainer slide *F* toward the inner sur-

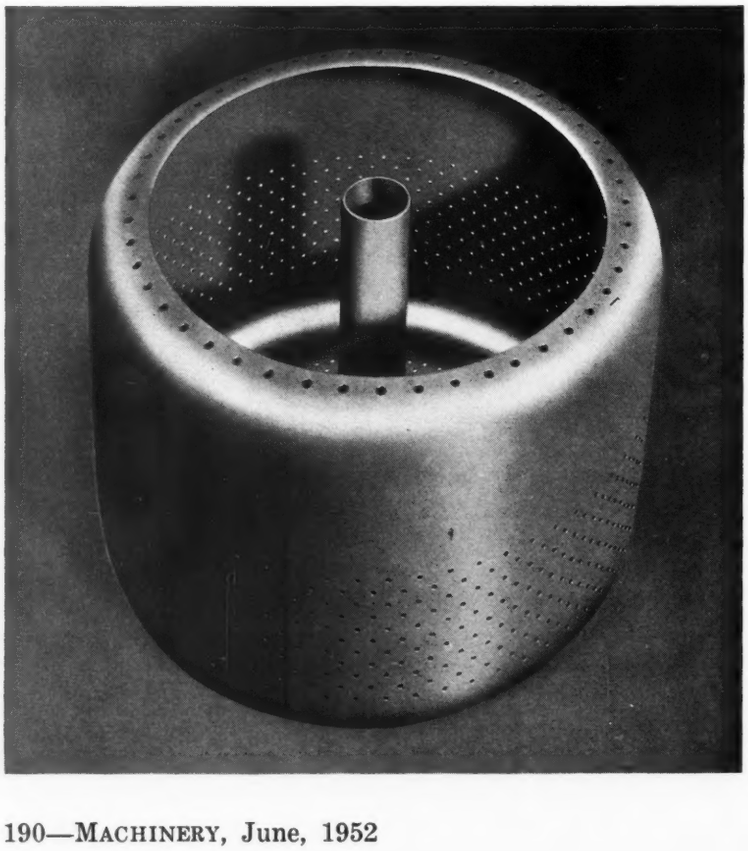


Fig. 1. Spinner basket used in automatic washing machines has 726 holes, 5/32 inch in diameter, pierced around periphery without producing burrs on the inner surface.

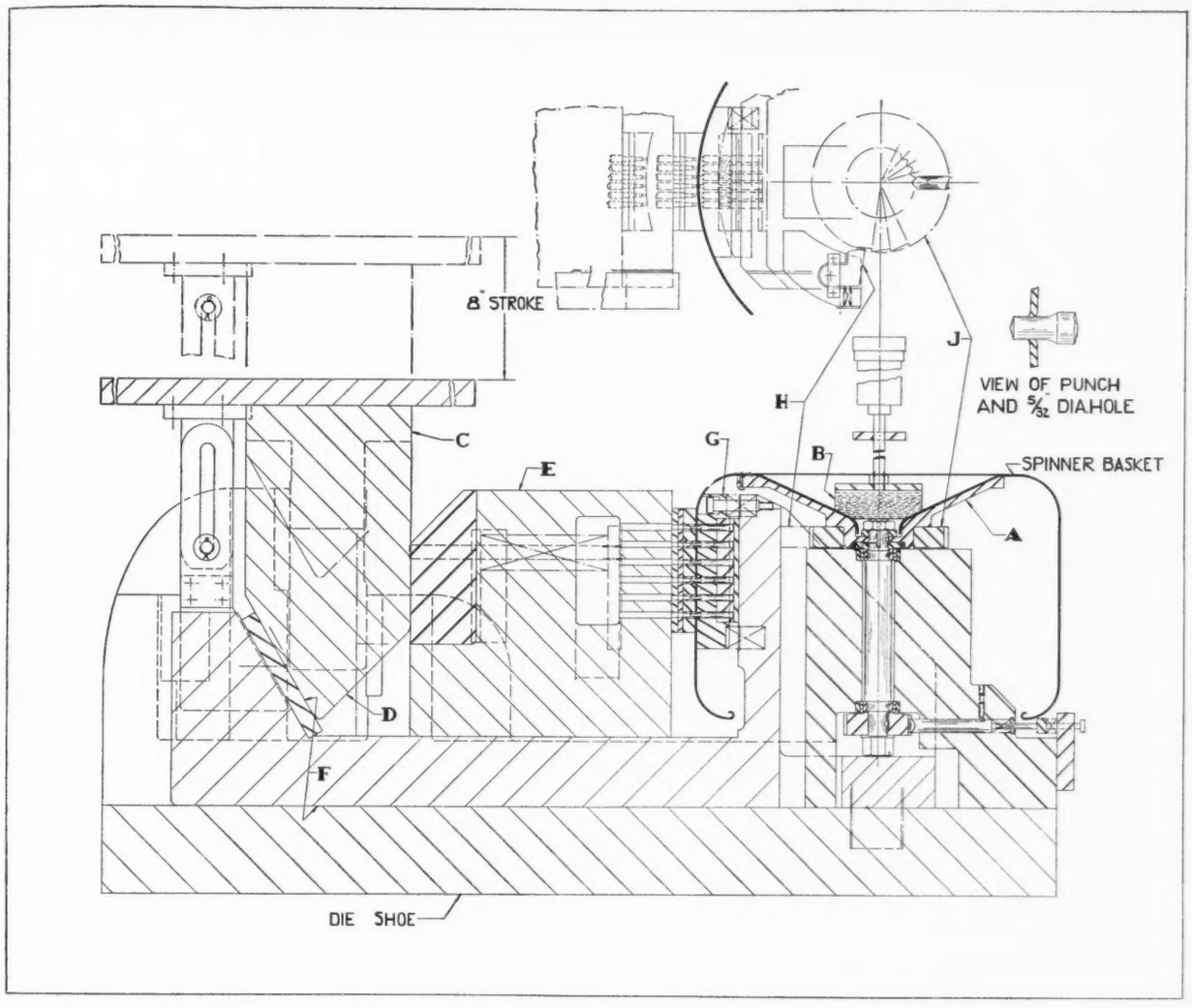


Fig. 2. Die employed for piercing 726 holes in the periphery of the spinner basket shown in Fig. 1. The punches operate from inside the basket, which indexes automatically, thirty-three holes being produced with each stroke of the press.

face of the basket, piercing thirty-three holes at one stroke. The stripper *G* operates on spring pressure. The upward stroke allows slide *F* to return to its starting position, extracting the punches from the basket. As the ram *C* continues to travel upward, it moves away from slide *F*, allowing it also to return to the starting position. During this action, but after both the punch retainer slide *F* and the punch button retainer slide *E* have cleared the basket, the indexing dog *H* operating the saddle through the ratchet *J*, rotates the basket into position for the next piercing stroke.

* * *

Better methods for casting aircraft dies have been developed for the Air Materiel Command by the Armour Research Foundation. Shrinkage and warpage are said to be controlled more effectively by improved techniques, including an application of flexible tubes to cool the metal dies.

Electronic Instrument Shows Press Overload

There is now available for the metal-working industry an electronic instrument which shows when a press is overloaded. It is believed that this device, which was developed by the Henry & Wright Division of Emhart Mfg. Co., Hartford, Conn., will save a great deal of money in reducing damage to presses and lost production time.

The "Dieometer," as the device is called, shows the force a press must apply to make a given metal part. It indicates how the load is distributed throughout the press and whether any component of the press is under too great a load. When overloading occurs, the device stops the press. Another feature is that finished pieces are counted. The instrument was shown to the trade for the first time at the recent Industrial Exposition of the American Society of Tool Engineers.

Materials OF INDUSTRY

The Properties and New Applications of Materials Used in the Mechanical Industries

High-Strength Copper-Silver Alloy for Small Parts

A high-strength copper-silver bronze with high electrical conductivity has been announced by Handy & Harman, 82 Fulton St., New York 38, N. Y. This alloy, containing 94 per cent copper and 6 per cent silver, is available in the heat-treated and cold-worked condition. The heat-treated alloy exhibits tensile strengths ranging from 140,000 to 165,000 pounds per square inch, and its electrical conductivity (referred to standard copper) is 70 per cent. It is produced in round magnet wire sizes up to 0.160 inch diameter, and in flat wire sizes of equivalent cross-sectional area having a maximum width of 1/2 inch. Indicated applications are for spring parts requiring high electrical conductivity, also for watch and instrument parts which may be blanked from narrow strip. Machinability of the alloy is such that it is easily sheared and cut to a fine finish, and it has sufficient ductility to withstand some forming operations.

Anti-Corrosion Primer with Vinylite Resin Base

An anti-corrosion, high-adhesion metal-wash primer with a Vinylite resin base has been announced by the Vorac Co., Rutherford, N. J. Vorac H-400, as it is called, can be used under practically all types of coatings, and is versatile in formulation and application. Films are formed by the evaporation of solvents.

A zinc chromate compound, it is designed to provide an adherent base coating on most metals and alloys. Upon application by dipping, brushing, or spraying, it dries in less than thirty minutes. It is a metal conditioner, as well as a primer, and should be applied only to clean surfaces. The compound cannot be applied over a phosphated surface. This wash primer is always employed in conjunction with one or more top coats. It is supplied in two parts for mixing at the time of use.

Strippable Plastic Finish Provides Corrosion Protection

Development of a strippable plastic finish, VC-12, that provides protection against corrosion and abrasion, has been announced by the United Lacquer Mfg. Corporation, 1001 W. Elizabeth Ave., Linden, N. J. The new vinyl finish, available in clear and tinted clear colors, may be applied by spraying or brushing to all metal or wood surfaces. It sets to touch in fifteen minutes and dries hard overnight. This finish may easily be peeled off all non-porous surfaces in sheet-like form. Uses include the temporary masking of objects during manufacturing operations, as in the automobile appliance industries, and the lining of paint spray booths in factories. It is also used for protective purposes in metal-etching operations.

Water-Soluble Synthetic Cutting Fluid for Machining Tough Metals

A synthetic cutting fluid that forms a clear solution in water at room temperature, has been announced by Carbide and Carbon Chemicals Co., Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y.

Ucon Cutting Fluid H-660, as it is called, may be used in drilling, tapping, turning, sawing, milling, punching, and drawing stainless steel, carbon steel, chrome-molybdenum and other alloy steels, aluminum, and phosphor bronze. It can be rinsed from metal surfaces with cold water or vaporized in high-temperature, heat-treating operations. However, any fluid left on parts will provide a rust-protective coating.

For general machining operations, a solution of one part of the fluid in 2 to 2 1/2 parts of water works best, but the dilution ratio may be adjusted to meet specific requirements. In grinding operations, one part of the fluid in 25 to 33 parts of water has produced good results in terms of grinding-wheel corner wear, and resistance to forming and metal burning.

Continuous Lubricating Film Process for Cold-Forming Steels

The Detrex Corporation, Box 501, Detroit 32, Mich., has announced the development of the Extrudite process for the formation of a tough lubricating film on steels used for cold-forming.

The process consists of two warm immersion baths. Into the first of these the cleaned steel part to be extruded or cold-drawn is placed for five minutes, during which time it forms a fine porous phosphate coating. Immersion in the second bath for a period of from three to five minutes results in an impregnation of this coating with a heat-resistant lubricant.

It is stated that as the processed steel flows or is drawn in the die, it carries the phosphate and lubricant along with it. Under the most severe draw or extrusion, it is claimed that the protective "skin" will remain as a continuous covering over the part being worked.

Silicone Release Agents for the Shell Process of Metal Casting

Three silicone release agents for use in the sand-resin shell process of metal casting were announced by the Dow Corning Corporation, Midland, Mich. These include Dow Corning Mold Release Emulsion No. 35, Dow Corning 7 Compound, and Dow Corning 7 Emulsion.

The two emulsions are of the oil-in-water type and can be diluted by the further addition of water. The No. 7 compound is a heat-stable, oxidation-resistant, grease-like silicone that retains its consistency over a temperature range of minus 40 degrees to over 400 degrees F., but must be applied directly by rubbing or swabbing or as a dispersion in a solvent such as methyl ethyl ketone, carbon tetrachloride, or naphtha.

The use of these agents permits the pattern plate to be utilized many times in the making of the molded shells, since there is a very small amount of build-up on this plate.

Compounds that Remove Rust and Provide a Phosphate Coating

Announcement of a chemical treatment that removes rust, tarnish, and light oil, chemically prepares metals for paint, and retards corrosion has been made by Octagon Process Inc., 15 Bank St., Staten Island 1, N. Y. The compound—"Rustclean"—not only chemically cleans the surface of steel, iron, aluminum, zinc, and cadmium, but also forms a phosphate coating which acts as a base for organic finishes. Moreover, it is an effective tarnish remover for copper and its alloys.

The two standard types of this compound are "Rustclean 12" and "Rustclean 15." The former is suitable for wiping on by sponge or brush, and the latter—a more concentrated compound recommended for use at elevated temperatures—is used in an immersion process. Both compounds are diluted with water, depending upon the degree of corrosion of the piece to be treated.

These compounds contain a mild acid which offers very little hazard to personnel. They do not produce fumes or emit toxic vapors, and can be employed in the same area where steel is finished or stored.

Compound for Controlled Etching of Aluminum

The Silver Star Chemical Corporation, 58 Watts St., New York 13, N. Y., has developed a compound for the controlled etching of aluminum and its alloys. "Star Etch," as it is called, helps to solve the problems of foaming, sludging, and hard scale formation often encountered in etching operations. Production of a uniform controlled etch is possible by either dipping or mechanical spraying. The bath is simple to operate and maintain, and, in addition, is said to be economical to use.

"Weld-Through" Sealer for Sheet-Welding Applications

An aluminum-colored "weld-through" sealer has been placed on the market by the Adhesives and Coatings Division of Minnesota Mining & Mfg. Co., 411 Piquette Ave., Detroit 2, Mich. This sealer—EC-1168—is applied to faying surfaces by means of a calking gun, pressure extruding equipment, or scraper before spot welding, thus eliminating the need for a sealing operation after welding. It does not interfere with the welding operation.

The sealer is a heavy paste-like material that is said to resist the heat and pressure of welding without splattering or burning. It shuts out air, dust, and moisture, and withstands paint-oven temperatures up to 475 degrees F.; it is not brittle at minus 10 degrees F. and does not support combustion. Protecting metal from corrosion is another advantage.

Automobile manufacturers use the material to seal the spot-welded joint between the roof and side panels of automobiles. Another use is the sealing of seams of ventilating and air conditioning ducts.

Lapointe Celebrates Fiftieth Anniversary

THE golden anniversary of the Lapointe Machine Tool Co., which is coincidental with the fiftieth anniversary of modern broaching, is being celebrated this year. Incorporated in Boston in 1902, the pioneering firm undertook the task of developing engineering principles governing broaching practice and of promoting the use of broaching methods, machines, fixtures, and tools that would combine speed with accuracy.

A year later, the company moved to Hudson, Mass., where it continued to grow and lead in the development of new broaching equipment. Among the highlights of the company's achievements, beginning in 1902 with the first screw type broaching machine, were the Lapointe broach sharpener (1923), which enabled the ordinary shop to do its own broach sharpening; the "Rotor-Kut" (1925) for handling primary operations, particularly on malleable iron castings and forgings; and the first automatic indexing and turret machine for performing multiple operations and multiple cuts (1941).

During World War II, the Lapointe organization assisted the Ordnance Department of the United States Army in fostering precision mass production by solving many engineering problems through broaching. Company engineers were assigned to war production plants, their goal being to deliver more weapons on time. Broaching machine users, according to Lapointe engineers, are applying the valuable planning and production lessons learned in that war to today's defense production. For example, a 20-millimeter gun barrel can now be rifled in three minutes by broaching instead of the former time of four and one-half hours.

Commemorating their fifty years of progress, the company has produced an attractive booklet entitled "Life Was Like That—Before Broaching." Chiefly pictorial, the book points out the improvement in methods of transportation, farming, housekeeping, and other phases of modern living since broaching was introduced. A limited number of the anniversary booklets are available to business executives, who can obtain single copies by addressing the Lapointe Machine Tool Co., Hudson, Mass.

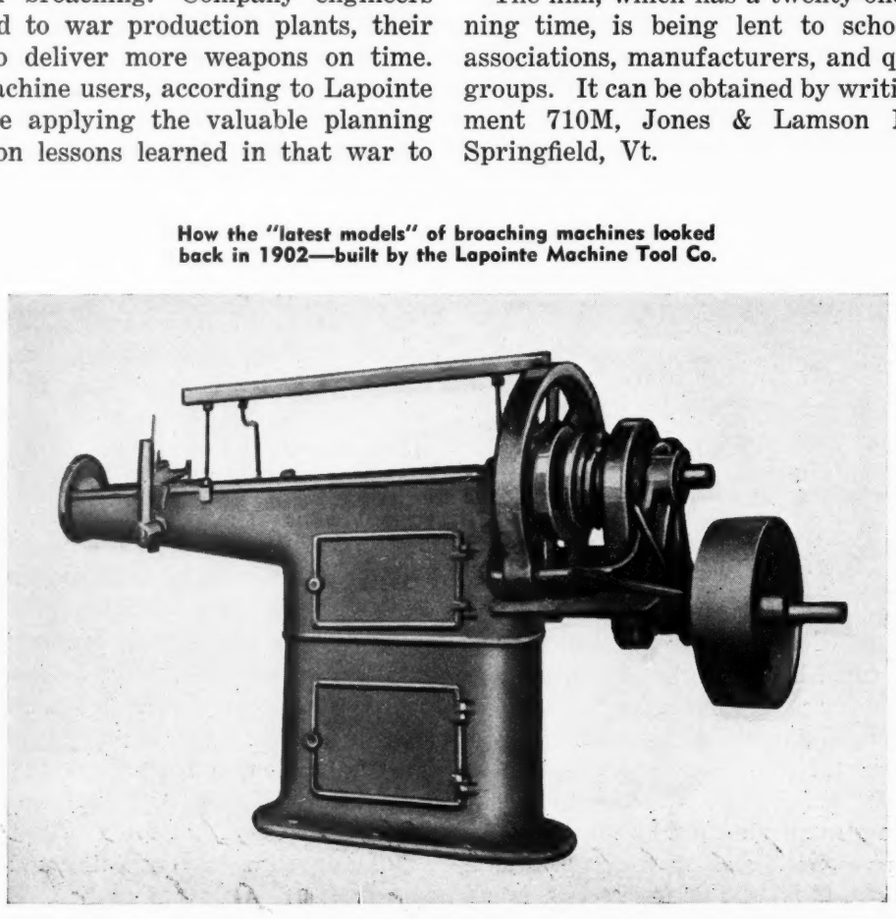
* * *

Film Shows Precision Measurement with Optical Comparator

"What's the Difference?" is a new sound color 16-millimeter motion picture released by the Jones & Lamson Machine Co., telling the optical comparator story—from "comparison" to "precision measurement." Production line scenes are taken in other plants under working conditions.

The film, which has a twenty-one minute running time, is being lent to schools, technical associations, manufacturers, and quality control groups. It can be obtained by writing to Department 710M, Jones & Lamson Machine Co., Springfield, Vt.

How the "latest models" of broaching machines looked back in 1902—built by the Lapointe Machine Tool Co.



INGENIOUS *Mechanisms*

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Intermittent Indexing and Pressure Applying Mechanism

By A. W. JANSSON

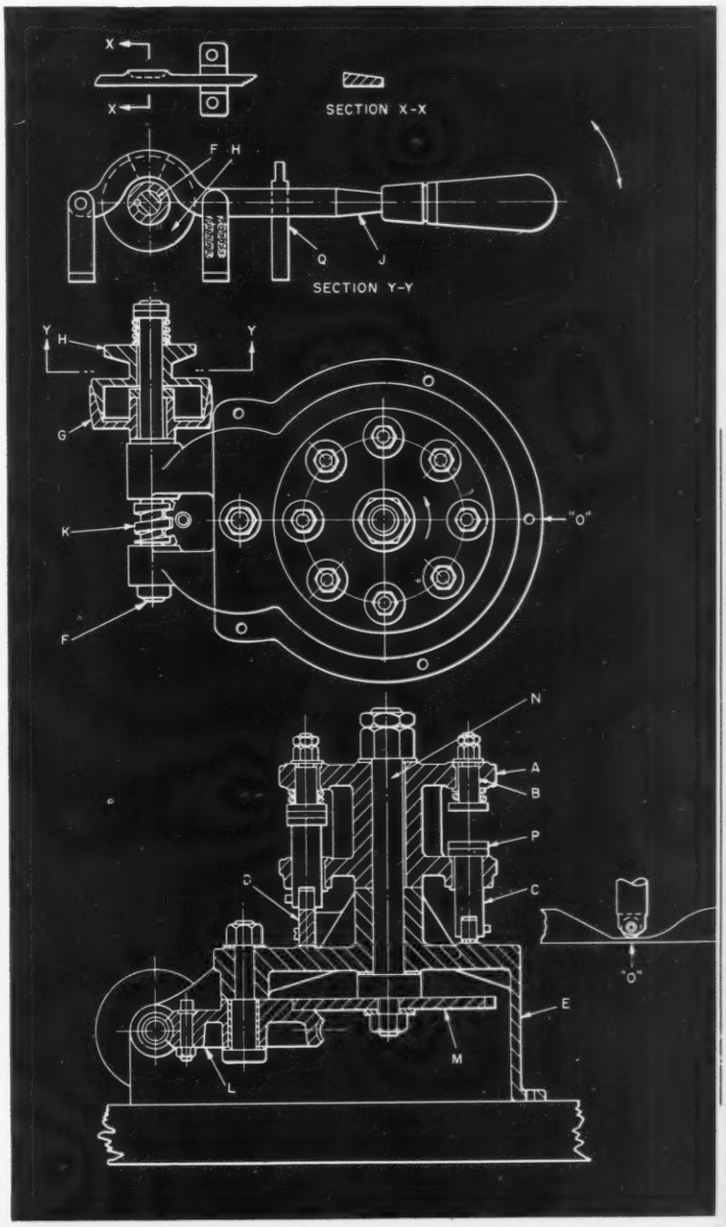
The gluing of paper watch dials to their metal backings originally required the use of four presses and four operators. In order to reduce labor and equipment costs, a gluing device incorporating an ingenious operating mechanism was developed to do this work. The new device required only one operator, eliminated scrap, and enabled the work to be done with greater safety.

In designing this device, it was necessary to incorporate means for holding and pressing the paper dials and their metal backings together for a sufficient period of time to allow the glue to set. This requirement was met by providing the fixture with eight cam-operated pressing spindles mounted in an intermittently indexed eight-position spindle-carrier, with one position reserved for loading and unloading the work. The spindle-carrier is operated at the correct speed to permit proper setting of the glue in one complete revolution of the carrier. A glued dial and its backing is removed from the loading station designated "0" and replaced by new pieces during the dwell period following each indexing of the spindle-carrier. Thus eight glued dials are completed in one revolution of the spindle-carrier, each dial and its backing being under pressure during one revolution of the carrier.

The essential features of the mechanism designed to operate the gluing device are shown in the accompanying illustration. The mechanism is driven by a motor through a belt passing over the friction pulley *H* and a clutch operated by lever *J*. When the clutch is engaged, worm *K* on shaft *F* turns the worm-wheel *L*. The upper portion of the worm-wheel carries the indexing pin of a Geneva mechanism. At each revolution of the worm-wheel, the indexing disc *M*, which is fastened rigidly to vertical shaft *N*, is rotated one-eighth revolution. Since the spindle-carrier *A* is keyed to the vertical shaft, it also rotates.

The eight equally spaced pressure spindles *C* are mounted in the carrier *A* as shown. Directly above, and in axial alignment with each pressure spindle *C*, is a spring-backed spindle *B*. It is between the work supporting disc *P* on the upper end of spindle *C* and the disc at the end of spindle *B* that the watch dial and its backing are pressed together to complete the gluing operation. Both spindles *C* and *B* are provided with keys that slide in keyways to prevent them from turning in the carrier *A*. Slots at the bottom ends of spindles *C* accommodate rollers, which are in constant contact with a circular cam-ring *D*.

The cam-ring has a raised portion throughout



Mechanism used to glue paper dials to metal discs by applying sufficient pressure for a predetermined length of time

246 degrees of its circumference, sloping portions throughout 47 and 44 degrees, and a flat portion throughout 23 degrees, which is located between the sloping portions. The flat portion at the position marked "0" is directly in front of the operator, and it is at this location that a pair of spindles is loaded and unloaded.

Bed *E*, besides acting as a support for cam-ring *D*, houses the Geneva motion and worm-wheel and serves as a support bracket for the worm-shaft *F*. The driving pulley *G* engages the spring-loaded friction pulley *H* when the clutch lever *J* is in the raised position, imparting rotation to shaft *F*, worm *K*, and worm-wheel *L*.

In operation, the parts to be glued are placed by the operator on the disc *P* of the spindle that is in the "0" position. The correct positioning of the paper dial and metal backing on disk *P* is facilitated by means of locating pins (not shown). The operator then releases the flat hooked spring *Q*, which allows spring-loaded clutch lever *J* to move upward. This, in turn, releases driven pulley *H* and engages the train of members that drive the spindle-carrier *A*.

As the spindle-carrier rotates, the pressure spindle *C* is moved upward by the action of its roller on the circular cam-ring *D*. The pressure exerted on this member by the spring-loaded spindle *B* is sufficient, both in magnitude and duration, to permit setting of the glue. As one spindle is loaded and moved into the position where pressure is exerted, the pressure on the spindle immediately following is relieved. Its roller then follows the descent in the cam-ring under the influence of gravity in moving into position "0". Once in this position, the bottom spindle is quickly unloaded and reloaded.

The mechanism is stopped by depressing lever *J*, which disengages the driving pulley *G*. The clutch lever also acts as a friction brake. It is locked in the depressed position by means of flat hooked spring *Q*.

Press Clutch Automatically Disengaged after Required Number of Strokes

By L. KASPER

An indexing die was designed for piercing a number of equally spaced holes in drawn sheet-metal parts or shells. The shells were rotated a partial revolution with each stroke of the press, and the operator disengaged the press clutch when the required number of holes had been pierced. The effect of the human element soon became apparent by the production of a number of parts with one or more holes missing. It was then decided to control the number of strokes per shell automatically, and the mechanism shown in the accompanying drawing was designed for this purpose.

In the end views seen at the bottom in Fig. 1 and in Fig. 2, the crankshaft bearing and other details have been omitted for clarity. The press used for this operation has a sliding key clutch. Flywheel *A*, rotating in the direction indicated by the arrow, transmits motion to the crankshaft *B* through the sliding key *C*. The spring-loaded key is engaged and disengaged by the action of a wedge-ended lever *D*, which is operated by a foot-pedal through the clevis-rod *E*. This is the conventional design generally employed for this type of press.

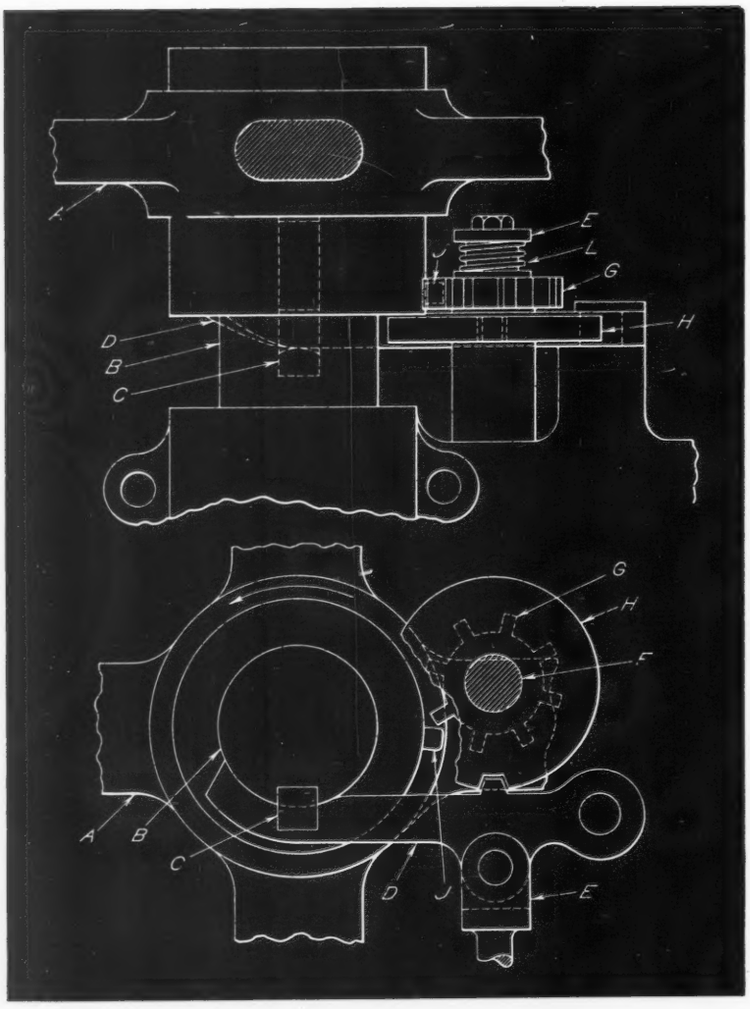
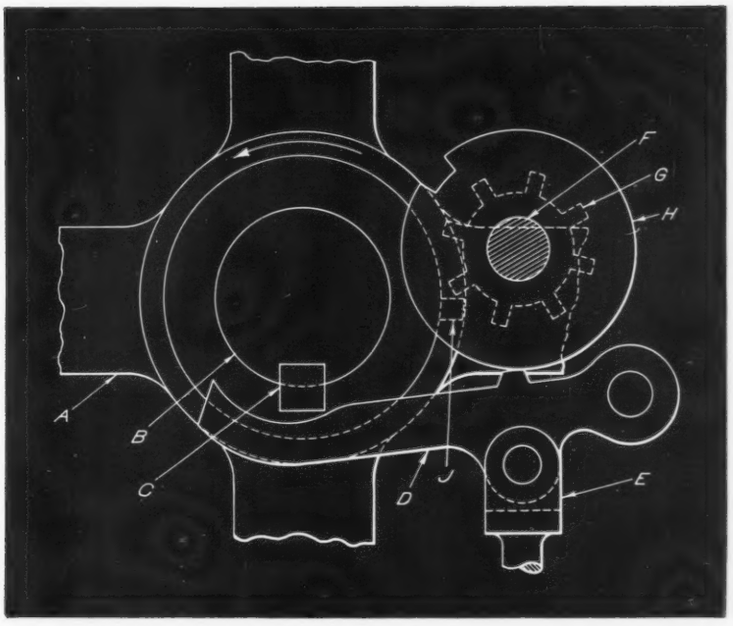


Fig. 1. Mechanism employed on a punch press to disengage the clutch automatically after eight strokes of the ram

Fig. 2. Spring-loaded sliding key (C) shown in its engaged position, with the flywheel (A) rotating crankshaft (B). When the ram has completed eight strokes, the projection on top of lever (D) will enter the groove in disc (H), thus disengaging the clutch



In Fig. 1, the sliding key is shown disengaged from the flywheel, and the press ram is stationary, permitting loading. A toothed disc *G* and a grooved disc *H*, keyed together, are free to rotate on a stud *F*, which is attached to the side of the press frame. Spring *L* applies frictional resistance to the rotation of discs *G* and *H*. Pin *J*, inserted in the crankshaft flange, contacts one tooth of disc *G* with each revolution of the crankshaft. A projection on the upper edge of lever *D* engages the groove in disc *H*.

When the work-piece has been placed in the die, the foot-pedal is depressed and lever *D* is withdrawn from the groove in sliding key *C*, as seen in Fig. 2. The key then engages the rotating flywheel and locks the crankshaft to it. As soon as the crankshaft starts to rotate, pin *J* contacts one tooth on disc *G*, causing it and disc *H* to rotate a partial revolution. The projection on lever *D* is now in contact with the periphery of disc *H*, thus preventing the wedge end of lever *D* from entering the groove in key *C*. Continued rotation of crankshaft *B* causes disc *G* to be rotated, one tooth per revolution, until the projection on lever *D* again enters the groove in disc *H*. In this position, lever *D* is permitted to return to the disengaging position.

The number of strokes per cycle is governed by the number of teeth on disc *G* and the number of grooves in disc *H*. It is necessary, however, that the number of teeth on disc *G* be a multiple of the number of grooves in disc *H*.

* * *

It is stated that 45 per cent of the automobiles in use in the United States have been driven more than 40,000 miles.

Molecular Grains in Cartridge Brass Should be Small

Application of the "fragmentation theory" to produce harder, stronger cartridge brass for Uncle Sam's defense effort was proposed at a meeting of the American Society for Metals. This means that the molecular grains in cartridge brass should be kept to a small size.

Experimentation to establish the relationship between microstructure (grain size) and the strength properties of cartridge brass was described in a paper which stated that the results of hardness, tensile strength, and fatigue tests performed on cartridge brass appear to be consistent with the "fragmentation theory."

According to this theory, too large or imperfectly formed grains differ slightly from one another in orientation, and tend to rotate in an attempt to effect a stable orientation. Imperfections of this sort, it was pointed out, come from improper heat-treatment.

Fatigue tests were performed on cartridge brass at a speed of 8000 to 10,000 revolutions per minute on machines of the rotating cantilever beam type. Each revolution bent or otherwise stressed the material.

* * *

Self-lubricating bearings of Durex material made by powder metallurgy methods by the Moraine Products Division of General Motors are approximately 20 to 30 per cent porous. These tiny pores hold enough oil so that, in some applications, they never need additional lubricant. The oil increases the weight of the bearing from 5 to 10 per cent after impregnating.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Local Taxation of Mechanical Accessories

A. K.—We received certain mechanical accessories from another county, which were placed in our stock. Local county authorities claim we must pay taxes on these accessories. Can they collect such taxes from our company?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

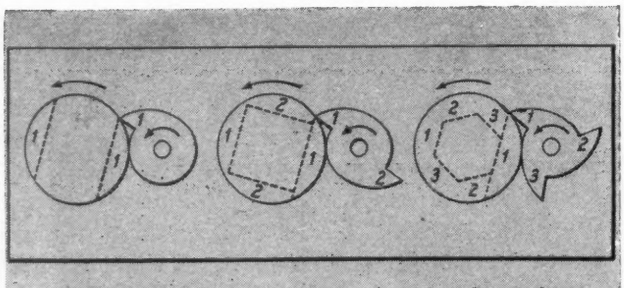
The laws of the United States provide that no state, county, or city shall tax goods, materials, or merchandise imported and left in its "original package." However, the instant a package is broken, the contents are taxable by the state.

In E. J. Stanton & Sons vs. Los Angeles County [177 Pac. (2d) 804], Stanton & Sons imported merchandise and sold it at wholesale and retail. The testimony showed that after a shipment was received, sales were made from time to time. Under these circumstances, since the merchandise was not allowed to remain in its original package, the higher court held that the state and county could tax it.

Turning Square and Hexagonal Work

L. M. S.—I have been told that there is a machine or attachment for turning square and hexagonal-shaped work in which both the work and a single-point cutting tool are rotated. Can you explain briefly the operating principle of such equipment?

A.—A Wickman flat generating attachment fitted to a multiple-spindle automatic was shown at a machine tool exhibition in 1948, and described in the February 16, 1950, issue of *British Machinery*, page 223. Both the work-spindle and the cutter-spindle of the attachment described rotate in the same direction with a fixed speed ratio of two revolutions of the cutter-spindle to one revolution of the work. Parallel flats are generated by single-tooth cutters, squares by two-tooth cutters, and hexagonal-shaped pieces by three-tooth cutters, as shown in the illustration.



Diagrams showing operating principle of attachment for machining flats, squares, and hexagons

* * *

Copper Supplies to Become More Plentiful

While it is true that there exists at present a serious shortage of copper, this condition should be alleviated in the near future, according to the "Copper and Brass Bulletin." The shortage of copper was particularly evident in 1951 compared with 1950, when the total supply available was the highest since World War II. Also, there was a much increased demand due to the expanding defense program and the civilian need.

The shortage of copper was in part due to the fact that net imports of ore, crude, and refined copper were 150,000 tons less in 1951 than in the preceding year. Stocks, which had been depleted by more than 125,000 tons in 1950 to augment the supply, were at rock bottom and could not be drawn on further in 1951. While domestic production increased somewhat, nevertheless there were 240,000 tons less copper available in 1951 than in 1950. Withdrawals from the stockpile of 55,000 tons in 1951 were, therefore, only partly effective. Labor interruptions both here and abroad, particularly in Chile, were also responsible for the shortage of copper last year.

* * *

Use of Diesel Power in Industry

The Diesel engine is a relatively new source of power which only began to find widespread use in the early 1930's when Charles F. Kettering of General Motors designed a two-cycle Diesel engine which was smaller, lighter, and more flexible than most Diesel engines of that day. Since then Diesel power has become practical for a great variety of uses in many industries.

TOOL ENGINEERING *Ideas*

Tools and Fixtures of Unusual Design and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Simple Method of Grinding Uniform Clearance in Dies

By J. SORENSEN, Kobenhavn Valby, Denmark

One of the many factors that influence the durability of stamping dies is the amount and uniformity of the clearance provided between the punches and dies. Small shops not equipped with special profile grinding equipment often have difficulty in controlling this factor when making dies having complex contours. A simple method of obtaining uniform clearance in such dies with standard equipment will be described in this article.

Using the hardened punch as a template, the die is marked and sawed to the required shape. It is then filed to the desired relief angle, leaving a stock allowance for profile grinding. After hardening, both upper and lower faces of the die are surface ground.

The next step is to make a thin template of approximately the same over-all size as the die. The punch is again used to mark the contour of the stamping on the template, which is then sawed to shape and filed at right angles to the top and bottom surfaces, leaving a small amount of metal for finishing. With the punch ground sharp, it is pressed through the template, thus shaving off the small amount of stock left in the hole after filing and producing an accurate copy of the required contour in the template.

The template is now placed on the cutting surface of the die with the openings in both parts aligned, and secured in this position by dowels passing through the template and the die. With the assembly clamped in a swivel vise, it is tilted to the relief angle desired in the die, as seen at the left in Fig. 2.

The vise is used on a standard horizontal milling machine, and a portable electric grinder is secured in V-blocks on an angle-iron attached to the front of the arbor support, as seen in Fig. 1. A cutter grinding machine having an internal grinding attachment would be more convenient for this operation if available.

A partial cross-section of the die and template assembly after grinding is seen at the right in Fig. 2. The relief angle in the die and the angle of inclination of the assembly are indicated by R, and the clearance that will be provided between punch and die is designated as C. As the clear-

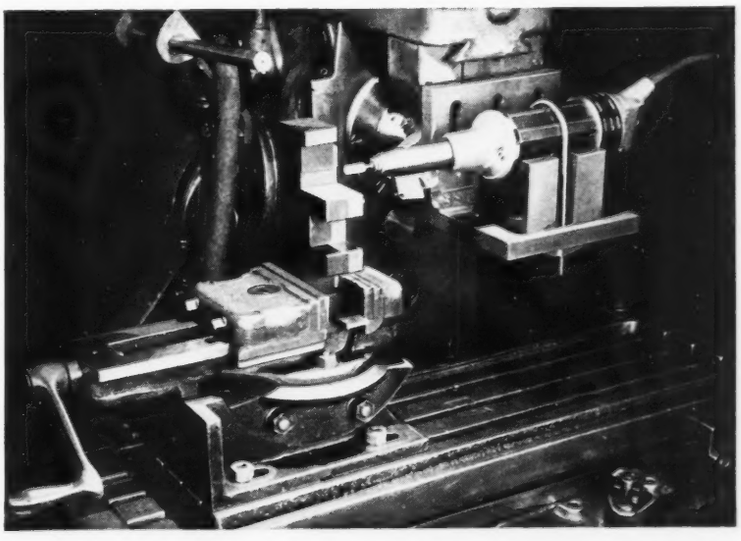


Fig. 1. A simple method of grinding uniform clearance in dies employs a swivel vise mounted on the table of a standard horizontal milling machine and a portable electric grinder held on the front of the arbor support.

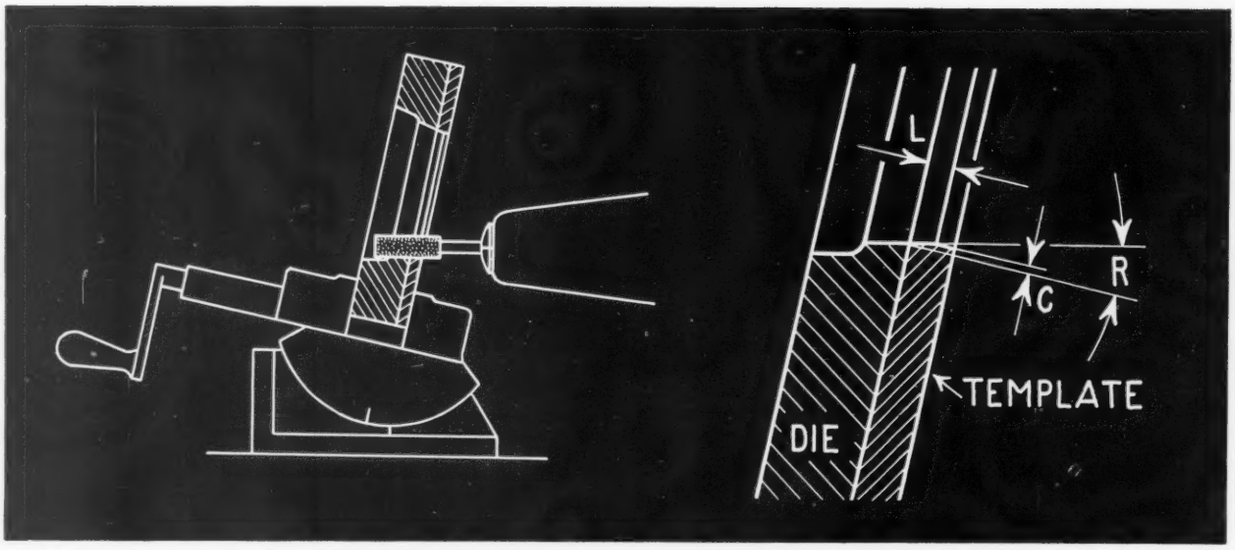


Fig. 2. Assembly of template and die are swiveled to desired relief angle (R) and ground to obtain the required clearance (C).

ance is so small that it would be difficult to lay out on the template for grinding the relief surface in the die, the corresponding land L is ground on the edge of the template. This dimension is found by the formula:

$$L = \frac{C}{\tan R}$$

Then, if a clearance (per side) of 0.0025 inch and a relief angle of 1 degree are desired,

$$L = \frac{0.0025}{\tan 1 \text{ deg.}} = \frac{0.0025}{0.01745} = 0.143 \text{ inch}$$

To produce the desired clearance, a line is scribed in the punched hole in the template 0.143 inch from the edge of the template that adjoins the cutting surface of the die, and the die and template are ground until the generated land in the template reaches this scribed line.

As the surface being ground must always be horizontal, it is necessary to turn the assembly of die and template for each different surface to be ground. For dies with curved surfaces, a dividing head would be used in place of the vise. When the die has been completely ground, the template may be filed and used as a stripper plate.

Combination Outside and Inside Calipers

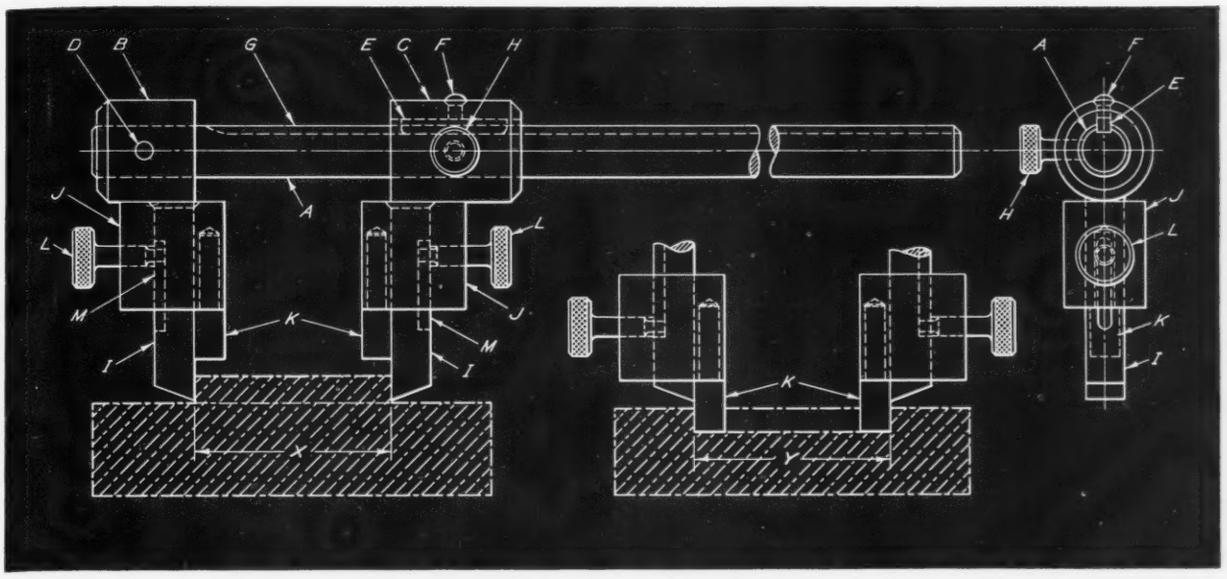
By W. M. HALLIDAY, Birkdale, Southport, England

Machining or inspecting mating surfaces of male and female parts can be greatly facilitated by using the calipers here illustrated. Conventional transfer caliper gages of this type are generally limited as to the width of opening that can be inspected. Also, means are usually not provided for locking the legs in any set position, and it is sometimes difficult to take micrometer readings from the opening between the legs. The improved type of beam transfer caliper here described is free of such limitations.

The instrument consists of a steel beam A of suitable length, a stationary head B, and a movable head C. Both heads are tubular members, the stationary head having a press fit and the movable head a sliding fit on the beam. The stationary head is doweled to the beam by a pin D. The movable head is kept from rotating by a key E (retained in the bore of the head by a rivet F), which engages a keyway G. Head C can be set at any distance from head B by means of a thumbscrew H.

From each head extends a hardened steel leg I. The legs are fitted with a rectangular block J in which is pressed a cylindrical pin K, immediately adjacent to the leg. A thumb-screw L in each block has a dog point which engages a slot M cut along the outside of the leg. By loosening screw L, the blocks can either be raised, so that an outside measurement can be taken by the legs, or lowered, so that pins K protrude below the legs, in which position an inside measurement can be taken.

The instrument is used by adjusting the movable head along the beam until the legs or pins establish a light contact with the work. The head is then locked and the measurement transferred to a micrometer. Or the movable head can be set so that the legs are a predetermined distance apart and the instrument used as a gage. Graduations can be engraved on the beam of the calipers and a witness mark engraved on the movable



To take an outside measurement (X), blocks (J) are raised on legs (I). To take an inside measurement (Y), the blocks are lowered.

head, so that measurements can be read directly.

With calipers of this design, an outside and an inside measurement can be immediately compared without changing the setting of the movable head.

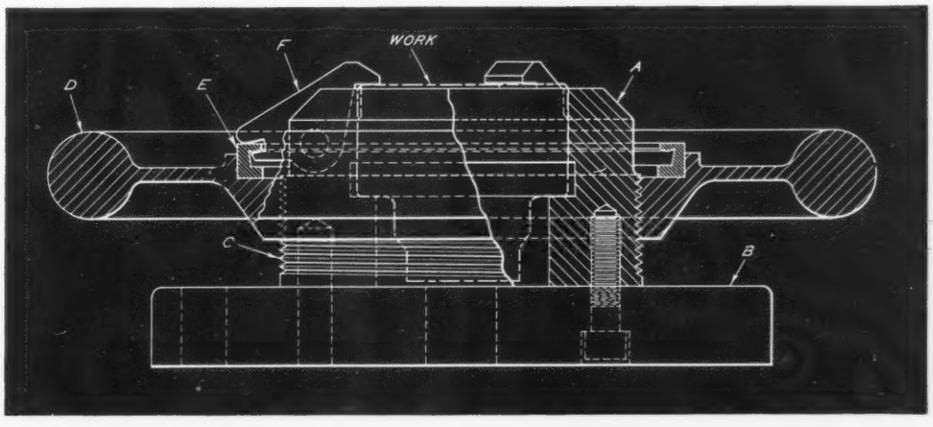
Quick-Acting Fixture for Secondary Operations

By R. MERY
Liberty Products Corporation, Farmingdale, L. I., N. Y.

Secondary engine lathe or turret lathe internal operations, such as boring, recessing, reaming, or threading, can be performed to a high degree of concentricity on work having a finished outside diameter by holding the piece in the type of quick-acting fixture seen in the illustration. The body *A* of the fixture is doweled and fastened to a baseplate *B* which, in turn, is held centrally on the faceplate of the machine. A left-hand thread *C* cut on the body is engaged by the threaded hub of a handwheel *D*.

Inserted in the face of the handwheel is a pressure ring *E* controlling three fingers *F*, held by pins in slots cut radially in the fixture nose, 120 degrees apart. For the application illustrated, the body was bored to the diameter of the work at its large end and to a depth that would allow the front end of the work to protrude slightly from the fixture. The rear end of the body was then bored out large enough to accommodate the other diameters of the work. The shoulder formed between the bores serves as a stop for the work-piece.

To close the fixture, handwheel *D*, together with ring *E*, is rotated clockwise, causing fingers *F* to close in on the face of the work. (Since a clockwise turn of a mechanical clamping component customarily exerts a tightening action, the purpose in designing the threads left-hand is apparent.) To open the fixture for unloading, the ring is rotated counter-clockwise.



In this quick-acting fixture, the leverage of the fingers (F) on the face of the work is controlled by rotating the handwheel (D).

Both the pressure ring and the fingers are made of hardened chromium-molybdenum steel. The action of the groove in the ring with the notches in the fingers somewhat resembles that of a gear and rack, coordinating the handwheel and finger movement and eliminating the need for springs to open the fixture.

Drill Jig with Spring Clamping Device

By ROBERT MAWSON

Joint clips used to hold together split brass oil-rings made by the Dodge Mfg. Corporation, Mishawaka, Ind., are clamped by means of springs in the quick-acting drill jig seen in the accompanying illustration. The two clips *X* are of similar shape, but one has four No. 38 (0.1015 inch diameter) holes drilled through it, while the other requires two No. 38 holes and two 5/32-inch holes.

Hinged cover *A* of the drill jig pivots about a pin *B* that is held in the two vertical lugs welded to base *C*. Two grooves having the same contour as the work-pieces are milled in the base, and clearance holes for the tools are drilled through it. The eight drill bushings *D* are pressed into holes in the hinged cover, and a leaf spring *E* is secured to the under side of the cover by two screws. Pressed into the under side of the cover is a shouldered stop-pin *F*, the lower end of which rests against the bottom of a groove in the base when the cover is in the drilling position shown. The cover is secured in the drilling position by a thumb-screw *G* which passes through a slot in the cover and is screwed into the base.

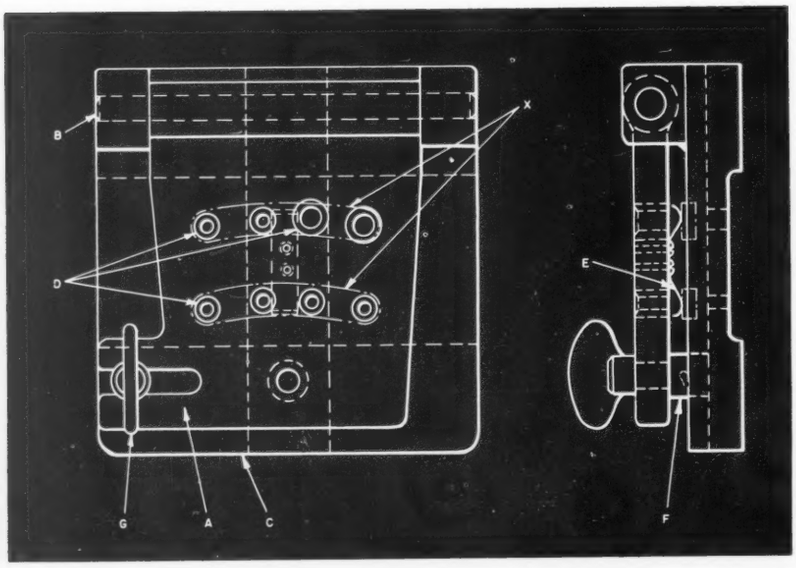
To load the jig, the thumb-screw is given a quarter turn, the cover is lifted, and two joint clips are placed in the slots in the base. When the cover is lowered and locked in place, the leaf spring secures the work-pieces. After the required holes have been drilled, the hinged cover is again lifted and the completed parts are lifted from the jig.

* * *

Semi-Annual Meeting of A.S.M.E. to be Held in Cincinnati

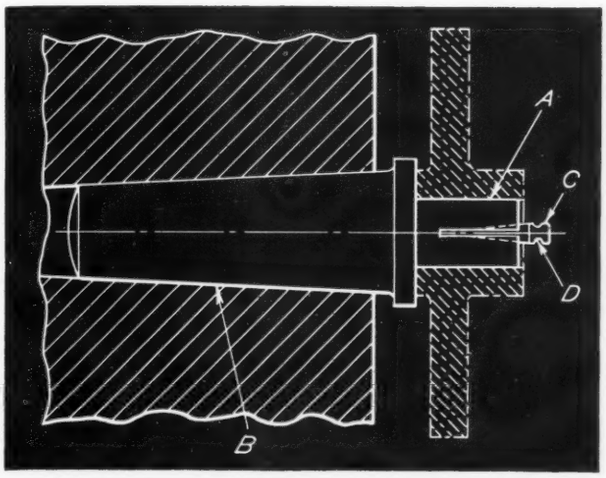
The semi-annual meeting of the American Society of Mechanical Engineers will be held June 15 to 19, inclusive, at the Hotel Sheraton-Gibson, Cincinnati, Ohio. Some of the papers to be presented of special interest to machine designers and production men in metal-working plants are as follows:

"High-Speed Surface Broaching Machine" by E. J. Rivoria and E. Raehrs, of the Cincinnati Milling Machine Co.; "Machine Tool Lubrication" by James R. Keen, of the American Steel Foundries Corporation; "Pressure Angles in Cam Roller Followers" by George Y. Ono, of the Case Institute of Technology; "The Effects of Solid Inclusions in the Oil Supply to Sleeve Bearings" by H. G. Rylander, Jr., University of Texas; "Radioactive Cutting Tools for Rapid Tool Life Testing" by E. J. Krabacher, M. E. Merchant, and Hans Ernst, of the Cincinnati Milling Machine Co.; "The Relative Abrasiveness of the Cast Surfaces of Various Gray-Iron Castings on Single-Point Tools of High-Speed Steel" by Joseph Datsko and O. W. Boston, of the University of Michigan; "New Developments in Cutting Metal" by R. J. S. Pigott, Gulf Research & Development Co.; and "Modern Machine Tool Lubrication Practices" by William D. Whalen, of the R. K. LeBlond Machine Tool Co.



Quick-acting jig employed for drilling four holes in two joint clips (X) that hold together split brass oil-rings after assembly. Leaf spring (E) holds the two work-pieces in grooves machined in base (C).

Ideas for Shop and Drafting-Room



An easily made expansion arbor for secondary lathe operations

Expansion Arbor for Secondary Lathe Operations

By F. C. WEVERS, Hengelo, Holland

A simple but effective work-holding arbor for secondary lathe operations is shown in the accompanying illustration. The device, made of mild steel, has a cylindrical nose *A* and a tapered shank *B*. A small tapered hole is drilled and reamed in the end of the nose to receive the pin *C*. A slit across the diameter of the nose intercepts the hole, so that when the pin is forced in, the nose expands in the bore in the work-piece.

In making the arbor, the shank is first finish-turned to correspond with the taper of the lathe spindle. Then, with the shank in position in the spindle, the tapered hole in the nose can be drilled and reamed from the tailstock. After the slit has been milled, the pin is inserted in the hole and the outside diameter of the nose is turned to the lower limit of the bore in the work-piece. A groove *D* in the head of the pin permits the pin to be easily extracted with a pair of pliers.

Extension Clamp with Replaceable Rods for Work of Various Lengths

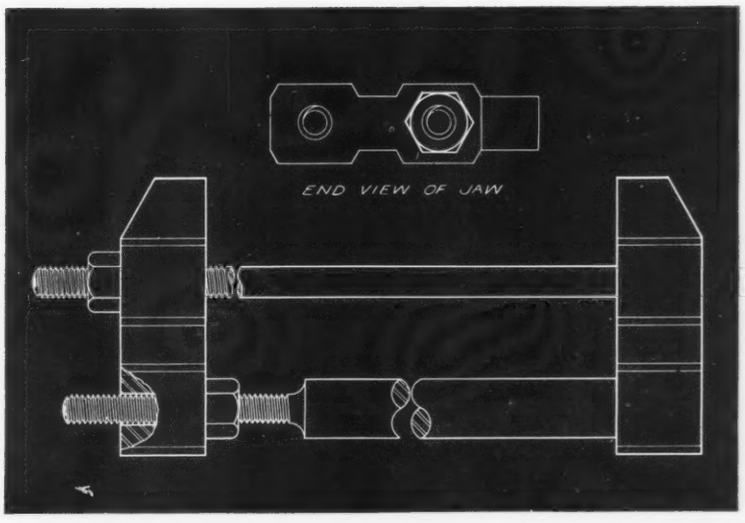
By JOSE SOBKOWIAK, Jackson, Mich.

The clamp here illustrated has been found useful for holding work on various types of machine tools such as planers, milling machines, surface grinders, etc. The jaws are made of hardened tool steel or of carburized cold-rolled steel. The two rods can also be made of cold-rolled steel, their sizes depending on the part to be clamped. However, the larger rod should be double the diameter of the smaller.

In operation, the nut on the larger rod is moved away from the jaw, and the jaws are placed around the work. Tightening the nut on the smaller rod will provide clamping pressure against the work, the jaw being limited in its travel by the position of the nut on the larger rod. Different lengths of rod can be made up for use with one pair of jaws for long or short work, thus making the clamp adaptable for work of various lengths.

* * *

To satisfy all kinds of needs, America's nail producers make more than one hundred different types of iron and steel nails.



Simple clamp for use in holding work of various lengths on such machine tools as planers, milling machines, surface grinders, etc. Clamping pressure is effected by tightening the nut on the smaller rod, while the travel of the jaw is limited by the nut on the larger rod.

Constructing Arcs Tangent to Circles

By JOSEPH FREEDSON, Design Engineer
Addressograph-Multigraph Corporation, Cleveland, Ohio

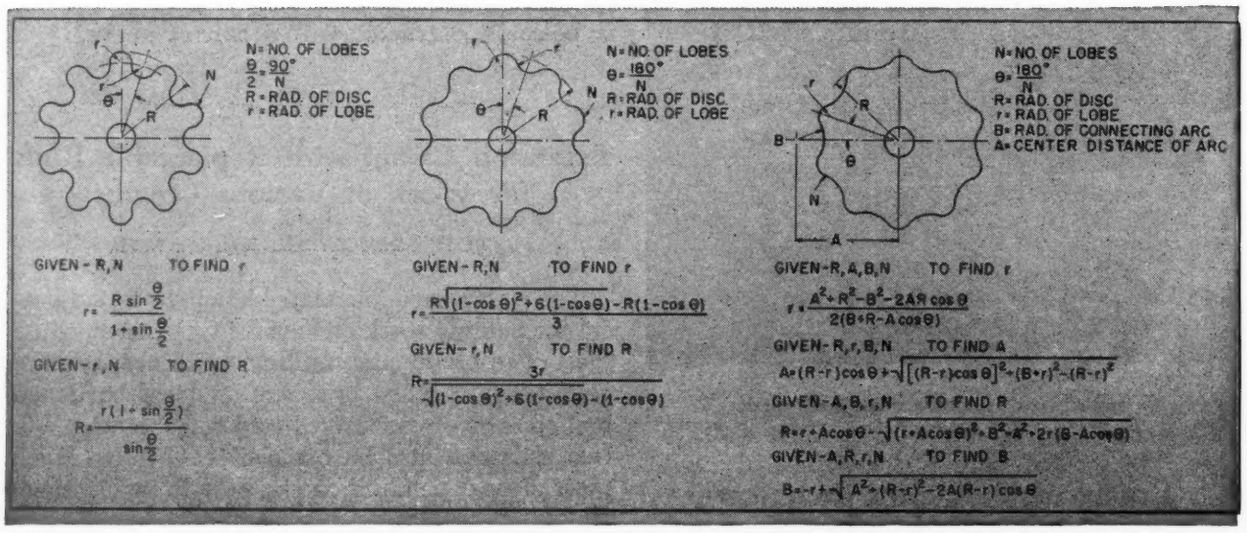

N = NO. OF LOBES
θ = 90°/N
R = RAD. OF DISC
r = RAD. OF LOBE
GIVEN - R, N TO FIND r
r = R sin θ/2 / 1 + sin θ/2
GIVEN - r, N TO FIND R
R = r(1 + sin θ/2) / sin θ/2
N = NO. OF LOBES
θ = 180°/N
R = RAD. OF DISC
r = RAD. OF LOBE
GIVEN - R, N TO FIND r
r = R√((1-cos θ)² + 6(1-cos θ)) - R(1-cos θ) / 3
GIVEN - r, N TO FIND R
R = 3r / √((1-cos θ)² + 6(1-cos θ)) - (1-cos θ)
N = NO. OF LOBES
θ = 180°/N
R = RAD. OF DISC
r = RAD. OF LOBE
B = RAD. OF CONNECTING ARC
A = CENTER DISTANCE OF ARC
GIVEN - R, A, B, N TO FIND r
r = A² + R² - B² - 2AR cos θ / 2(B + R - A cos θ)
GIVEN - R, r, B, N TO FIND A
A = (R - r) cos θ + √[(R - r) cos θ]² + (B + r)² - (R - r)²
GIVEN - A, B, r, N TO FIND R
R = r + A cos θ - √(r + A cos θ)² + B² - A² + 2r(B - A cos θ)
GIVEN - A, R, r, N TO FIND B
B = -r + √A² + (R - r)² - 2A(R - r) cos θ

Fig. 1. Formulas for calculating arcs tangent to circles under various conditions

AN article entitled "Constructing Arcs Tangent to Circles" by W. W. Quist was published in November, 1950, MACHINERY, and a comment on this article, by Paul Grodzinski was published in November 1951. The following describes several typical applications of problems of this kind and shows the solutions prepared by the author for each case.

At the left, Fig. 1, the centers of equal radii r, tangent to each other, are on the same arc. The example in the center is similar except that the equal and tangent radii r are not on the same arc, one of them being on an arc having a radius R. In the example at the extreme right, the tangent radii are neither equal nor are they on the same arc. Formulas for determining the unknown radii or their locations are given under each different set of conditions.

The cams shown in Fig. 2 offer similar problems as far as determining tangent radii are concerned. It will be noted that the formulas given under the cams are the same as those used under similar conditions in Fig. 1.

For example, the cam at the left in Fig. 2

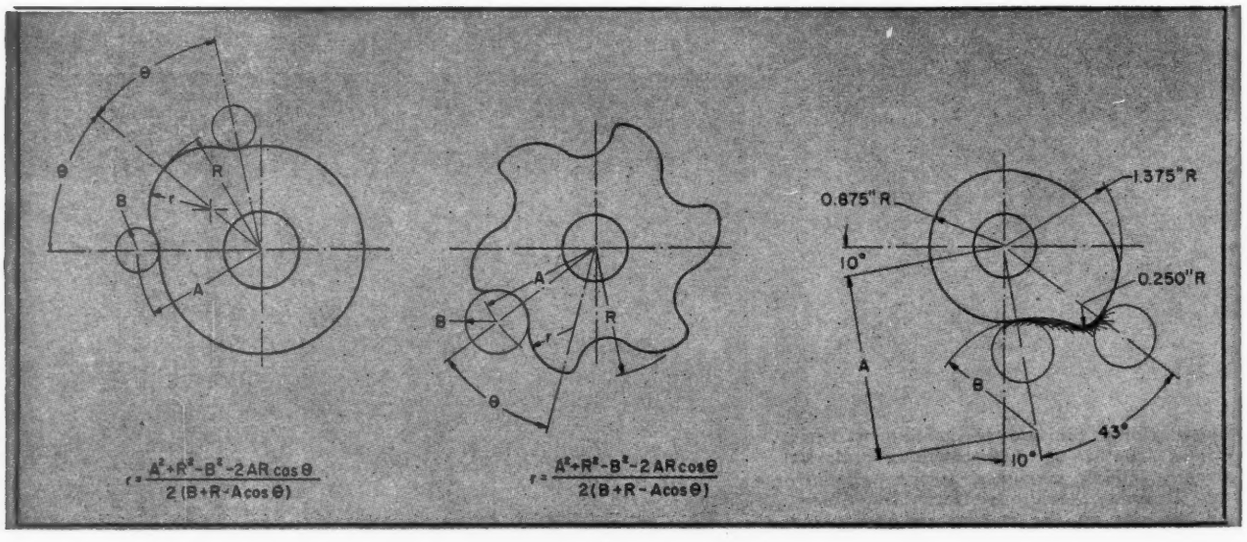


Fig. 2. Cams in which arcs are to be constructed tangent to circles

requires a radius r tangent to a roller with radius B. The following formula from Fig. 1

$$r = \frac{A^2 + R^2 - B^2 - 2AR \cos \theta}{2 (B + R - A \cos \theta)}$$

can be applied. Assuming that $A = 1.4375$ inch, $R = 1.500$ inch, $B = 0.250$ inch and $\theta = 39$ degrees, then:

$$r = \frac{(1.4375)^2+(1.500)^2-(0.250)^2-(2\times1.4375\times1.500\times0.77715)}{2[0.250+1.500-1.4375\times0.77715]}$$

$$r = \frac{0.9026}{1.2658} = 0.713 \text{ inch}$$

In the example at the extreme right in Fig. 2, the cam was designed for uniform acceleration with a rise of 0.500 inch in 43 degrees of angular displacement. A close approximation which simplifies machining the cam may be had by using two arcs. The curve for uniformly accelerated motion is laid out in the conventional manner, and, using a pencil compass, the 0.250-inch radius is found by trial. It remains to find radius B and dimension A, the distance from the cam center to the center of B. With angle θ equal to 43 degrees, radius R equal to 1.375 inches, and the tangent radii r 0.250 inch, the formula given at the right in Fig. 1, can be used:

$$B = -r + \sqrt{A^2 + (R - r)^2 - 2A (R - r) \cos \theta}$$

Since dimension A is not known, $0.875 + B = A$ is substituted. Then:

$$B = -r + \sqrt{(0.875+B)^2+(R-r)^2-2(0.875+B)(R-r)\cos 43^\circ}$$

$$(B+0.250)^2=(0.875+B)^2+(1.125)^2-2(0.875+B)(1.125)$$

$$(0.77135)\ 0.39556B = 0.5289 \text{ inch}$$

and

$$B = 1.3371 \text{ inches}$$

Cutting Fluids for High-Speed Screw Machines

Generally speaking, cutting fluids for use on high-speed automatics, such as Brown & Sharpe and Swiss models, should be of the low effective sulphur type, according to the D. A. Stuart Oil Co. However, the severity of any one operation in the machine cycle will weigh heavily in the proper recommendation of a cutting fluid. Threading and tapping are usually considered to be difficult machining operations due to the heavy cuts and limited chip clearance involved. Normally such operations need oils having a higher percentage of effective sulphur to prevent the tendency of welding and the resultant rough, torn threads on the finished work. It is, however, rarely necessary to apply extremely heavy sulphur concentrations in high-speed automatic operations.

* * *

Motion Picture on Syncrogear Motors

A motion picture in color and sound that features the development and application of internally geared electrical motors has been produced by U. S. Electrical Motors Inc., Box 2058 Los Angeles, Calif. Its appeal is aimed at electrical and maintenance engineers who desire to learn how best to apply geared power and to fully understand the design and characteristics of motors in the geared classifications.

This Pangborn rotating table blast cleaning unit has eliminated a bottleneck in the casting cleaning room at the Eclipse Lawnmower Co., Prophetstown, Ill. The unit consists of a 9-foot rotating table, carrying six 3-foot work-tables which also rotate around their own axes. The rotation of the large table carries the smaller tables through heavy rubber curtains into a blasting enclosure, where a stream of centrifugally hurled abrasive particles bombard the work. The secondary rotation of the smaller tables within the enclosure exposes all of the surfaces of the work to the abrasive stream.

Machine for Conditioning Cylindrical Extrusions for Aircraft

CYLINDRICAL extruded sections with integral stiffening ribs for use in aircraft wing and fuselage structures have been produced for some time. However, difficulties experienced in flattening and stress relieving extruded members to meet aircraft specifications have restricted the use of extrusions of this type. Engineers of the Longren Aircraft Co., Torrance, Calif., have recently developed a stretch-flattening machine to overcome application difficulties. This machine is designed to flatten the cylindrical internal-rib extrusions within the tolerances desired.

The extruded tubular sections are first split longitudinally, roughly flattened, then heat-treated. In stretch-flattening, the heat-treated integrally stiffened sections are end-mounted between mechanical V-clamps in the tension flattening machine shown in Fig. 1. One of the V-clamps remains fixed, while the other is mounted on a hydraulic piston. Using hydraulic pressure, the entire sheet is then placed under tension to a point just below the yield strength of the material.

After this initial stretching, the traveling carriage with its three rigidly mounted displacement rolls is started along the sheet from the stationary jaw end, Fig. 2. The movable chuck automatically takes up the slack of elongation and maintains even tension. The lower rolls of the carriage are sectional in design so that the tops of the extruded stiffeners rest firmly against an inner roll, while the outer rolls press firmly against the sheet area between the stiffeners. The upper roll is solid and smooth, and presses against what will be the external side of the flattened section.

As the traveling carriage progresses along the sheet, the material feeds over the first lower roll, then slightly downward under the upper center roll. Beyond the upper center roll it feeds upward again, and then returns to the plane of tension between the end clamping jaws after leaving the last displacement roll.

The greatest elongation takes place just as the material passes under the center roll. At this point, the material is stretched slightly beyond its yield point, and work hardening takes place. After the sheets have been flattened, they can be formed as desired on conventional stretch press equipment.

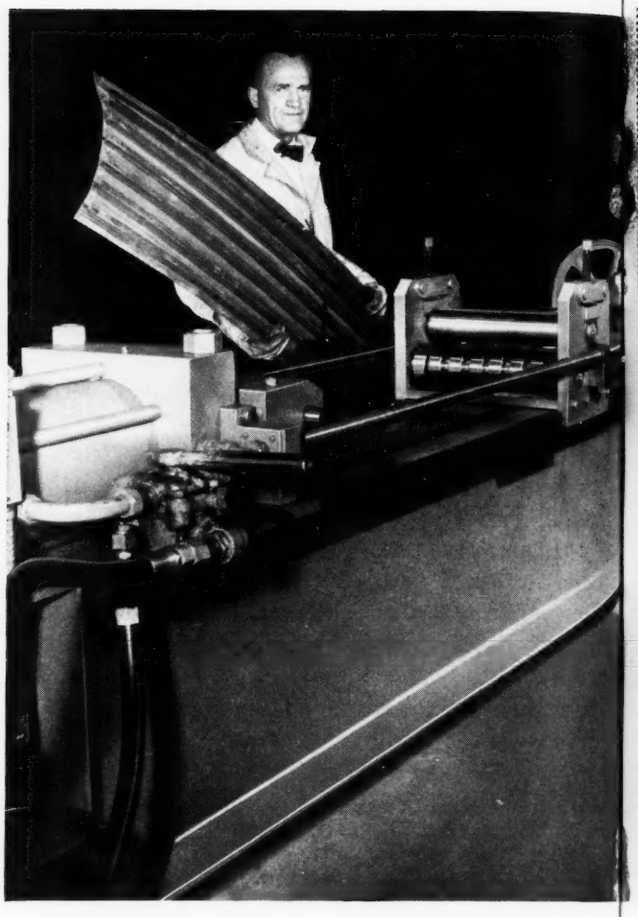


Fig. 1. Machine designed for stretch-flattening integrally stiffened cylindrical extruded aircraft skin sections

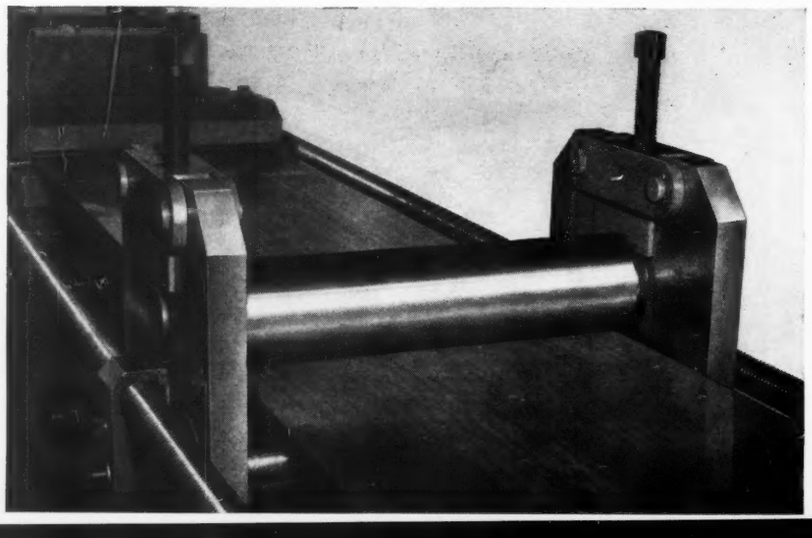


Fig. 2. Close-up view of roll unit stretch-flattening an aircraft skin extrusion

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

Are We Equipped to Meet Change?

NEVER in the history of selling to industry has the salesman's ability to meet change been more relevant than today.

An old graduate of an ivy-clad university reminiscently gives his reasons for selecting a term course in Biblical Literature while he was attending college. The fossil-like professor who conducted the course gave but one examination, and for the last twenty years it had called for an essay on the Travels of St. Paul. The course should be a cinch!

Confronted by the final examination, the class was completely caught off base. Lo, the examination called for an essay on the Sermon on the Mount! The boys either gave up, or scribbled down random thoughts that came to mind.

But one boy worked tirelessly throughout the whole period. Later he received a perfect mark. "What did you write about?" his classmates asked. "Oh, I just started out, 'Only the Master can interpret the Sermon on the Mount, so I will devote my time to the Travels of St. Paul.' "

This may illustrate not only the importance of resourcefulness, but particularly the significance of meeting change head on, and not depending upon the lucky break.

Many of our faces might turn red if we were asked: "Have your knowledge of the prospect's problems and your ability to solve them kept pace with the technical improvements in products and processes?" Many of us must honestly admit that the engineer's skill in devising new production methods has progressed faster and further than our skill in selling. True, the field has widened to a marked degree, but have our knowledge and skill kept pace with what's going on?

How can we improve our ability to meet change and capitalize on it in our selling?

First, and above all, comes our ability to bring some new ideas to the prospect. Thousands of examples exist for this opportunity and we can make suggestions based on our equipment, results desired, and competitive ways of accomplishment. One example, for instance, is that of machining or even grinding high-temperature alloys such as those used in jet turbines and other new machinery. Are we informed, or do we just listen and fumble for a way out?

The best way to be well informed is to consistently read current technical and trade literature. Are we "thumbers-through" of magazines, or selective, careful readers? The next thing is to observe, question, and listen. Are we sharp-eyed and mentally spry, or do we just glance around the plant we visit, thinking of the possible order?

Second, is our technical knowledge properly directed—used in the right place? The end result to the prospect is what counts. The possibilities of our own equipment or alternate methods are what entice and inspire the prospect.

Certain prospects will have much more technical know-how concerning specific materials and processes than we. But, being well informed, we can certainly stand our ground in discussion. Nothing destroys confidence more than misguided remarks that are irrelevant.

Third, in meeting change, is to size up conditions from the economic viewpoint. Many engineering prospects are so everlastingly absorbed in some abstruse theoretical problem that they lose sight of the business angle. Their conclusions are lop-sided. How many of us—expert in some precise line, and wrestling with a problem—have obtained good suggestions from a well informed visitor who looks at the woods rather than the tree.

Fourth, is to proclaim our convictions with proper emphasis. It's all very well to have ideas on how to meet change, but our convictions must sally forth like well directed arrows and strike the target hard.

LATEST DEVELOPMENTS IN *Shop*

Cincinnati "Hydroform" Metal-Forming Machines

A new line of "Hydroform" metal-forming machines designed to operate on a unique principle, has been introduced by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. The machines are now available in two sizes—the 26-inch size shown in Fig. 1 and the 12-inch size in Fig. 2, respectively—but can be made in sizes up to 40 inches. They operate on the principle of a solid punch member moving into a flexible, hydraulically pressurized die member. The die member is actually an oil cavity capped with a flexible diaphragm. Sheet-metal blanks placed between the solid punch and the flexible diaphragm of the die member are hydraulically formed to the shape of the punch.

Fig. 1. Cincinnati 26-inch "Hydroform" metal-forming press adapted for handling intricate as well as simple shapes

In operation, the blank is placed on the draw-ring seen at *A*, Fig. 3. The flexible die member is lowered and locked in the position shown at *B*. The initial pressure is then released, the punch member moving upward into the flexible die member. The blank is pressed tightly against the draw-ring surrounding the punch to control metal flow. As the punch moves up, pressure is automatically increased on the blank being formed, and the metal is subjected to uniform pressure from all sides, as indicated at *D*, Fig. 3. Stripping is accomplished automatically as the punch is retracted.

From the above outline of the operating principle, it is apparent that die sets to match the punches are not necessary. Tools consist of a simple draw-ring and a punch made to the shape of the part being formed. Because of the hydraulically controlled forming principle, the surface of the metal being formed is not subjected to scuffing or scarring action, and little or no abrasive action is imposed on the punch.

Hydroform machines consist essentially of the heavy base in which the bolster plate and punch are mounted, a dome containing the flexible die member, and four strain rods for securing these units. The hydraulic system is

Equipment

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on Market

Edited by FREEMAN C. DUSTON

equipped with a cooling unit to maintain the proper oil temperature. Electrical push-buttons, manual control levers, and set-up elements are all grouped at the operator's working position. An automatic cycle control unit is arranged with adjustable dogs or master cam-plates to control the complete cycle, including increased pressure in the dome while the piece is being formed, if desirable. Maximum pump pressure developed by the hydraulic system is 8000 pounds per square inch, although up to 15,000 pounds per square inch may be generated in the flexible die member as the punch moves up during the forming process.

To promote safety, the dome is interlocked in its "up" position while loading and unloading, and in its "down" position while the work is being formed. The dome control lever can be moved only after an operation has been completed. A two-position "form speed" control lever regulates the speed of the forming stroke, giving the operator a choice of high or low forming speed to suit the

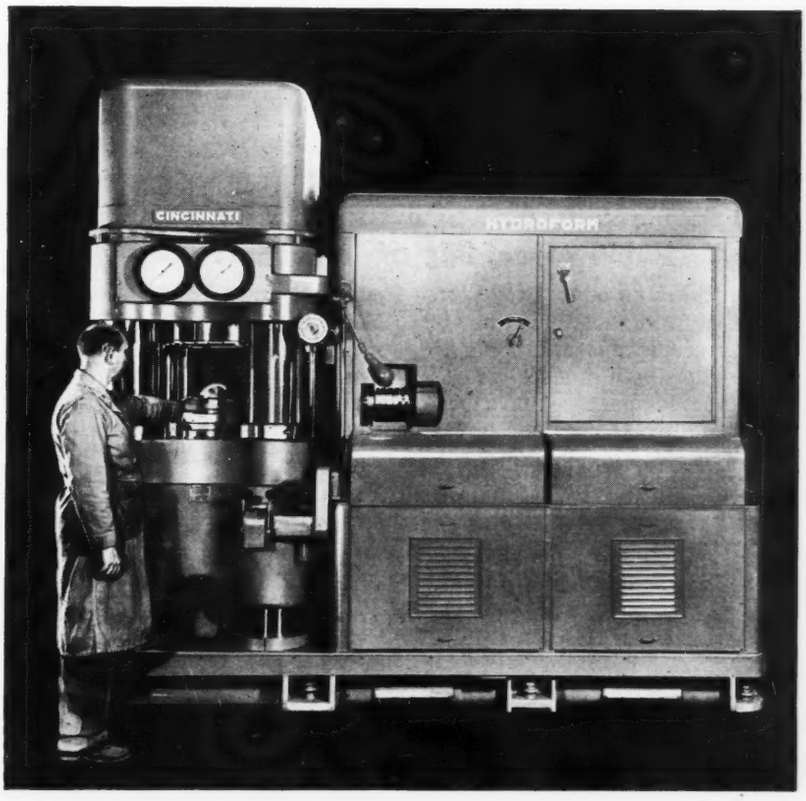


Fig. 2. Cincinnati 12-inch "Hydroform" drawing press with solid punch and flexible die member

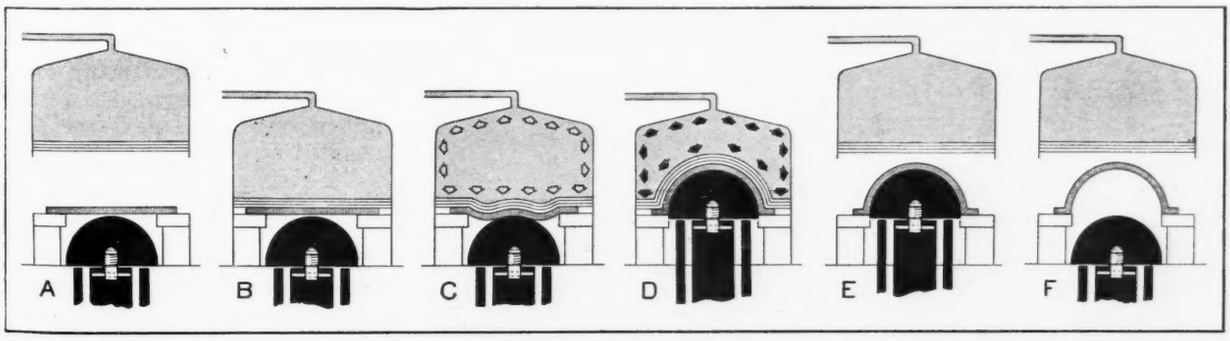


Fig. 3. Diagrams illustrating operating cycle of Hydroform presses. (A) Blank is placed on draw-ring. (B) Flexible die member is lowered and locked into position. (C) Pressure in flexible die member is established to a predetermined setting. (D) Punch is moved upward into flexible die member. (E) Flexible die member is raised. (F) Punch is stripped from finished part.

material, and the size and shape of the part. The flexible diaphragm unit is made up of two layers of material—the wear sheet and the inner member which confines the hydraulic oil in the forming cavity. Both layers of the diaphragm can be easily and quickly replaced.

The 26-inch Hydroform machine shown in Fig. 1 will handle work having a maximum blank diameter of 26 inches and a maximum draw depth of 12 inches. The maximum flexible die member pressure is 15,000 pounds per square inch and the maximum blank thickness is 3/8 inch in steel. The maximum operating rate is 90 cycles per hour. This machine has a net weight of 162,000 pounds. The forming unit is 7 by 7 by 12 feet (above floor level), and the power plant and tank is 71 by 141 by 45 inches high.

The power plant of the machine is in a pit 178 by 264 by 84 inches deep. Electrical equipment includes three 50-H.P. 1200 R.P.M. totally enclosed motors; three 50-H.P. motor starters; one 3-H.P. 1200 R.P.M. totally enclosed motor, and one 5-H.P. 3600 R.P.M. totally enclosed motor.

The hydraulic equipment includes three pumps of 20 gallons per minute capacity; one vane type pump of 1.3 gallons per minute capacity; one vane type pump of 5 gallons per minute capacity; and one centrifugal pump of 70 gallons per minute capacity. The oil capacity of the machine is approximately 400 gallons.

Monarch Right-Angle Lathes Developed for Rapid Machining of Jet Engine Parts

Two new 60-inch tracer-controlled right-angle lathes designed for fast, accurate machining of jet engine rings, vanes, discs, wheels, and other components have been announced by the Monarch Machine Tool Co., Sidney, Ohio. These machines are equipped with right and left power angular slides to which are added "Air-Gage Tracer" units. These units are designed to provide accurate control of contour turning operations on outside and inside surfaces, as well as contour facing, metal templates being used to obtain the desired contours.

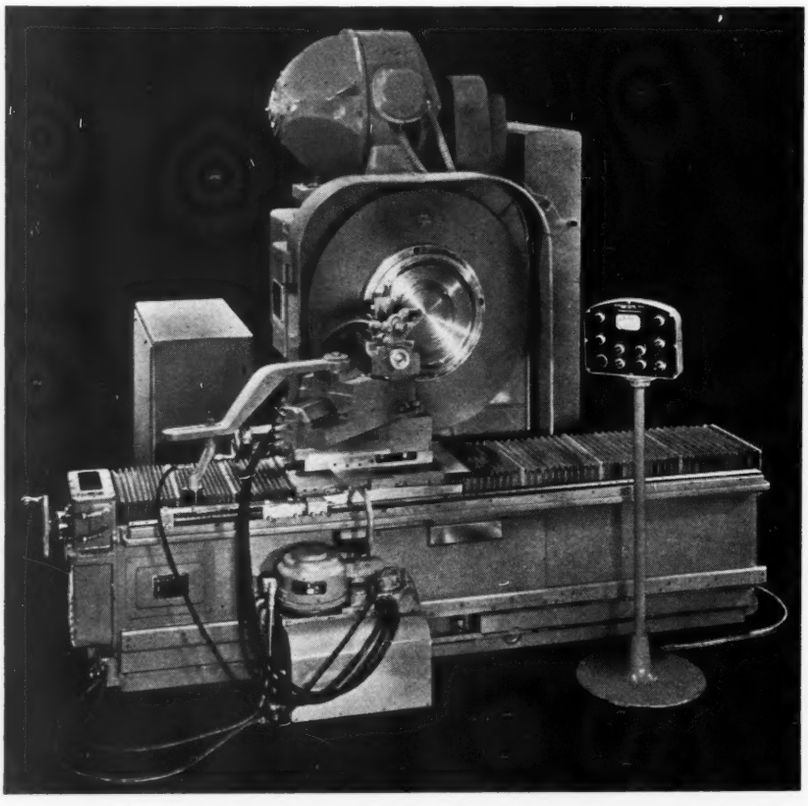


Fig. 1. Monarch 60-inch Model F right-angle lathe equipped for constant surface cutting speed, and so designed that tool can operate on both sides of center in manner indicated diagrammatically in Fig. 4

The Model F lathe, Fig. 1, is equipped to provide a constant surface cutting speed, and is so designed that the tool will operate on both sides of the axial center line of the rotating work, as shown diagrammatically in Fig. 4. This feature facilitates the finish-facing of jet engine discs, wheels, and comparable parts. The Model O machine shown in Fig. 2 has a sixteen-speed, helical-geared headstock, and for maximum productivity is supplied with two slides —one for turning and the other for boring. One of the slides is always "Air-Gage Tracer" controlled, although both slides may be controlled in this manner, making it possible to produce many work-pieces at one chucking. In some cases, both slides may be operated simultaneously, thereby reducing production time still further.

This lathe has been developed particularly for the finish-turning and boring of jet engine rings, vanes, shrouds, and work of similar shape. Both the Model F and Model O lathes take either a 40- or 52-inch faceplate. Work up to 60 inches in diameter may be swung in the gap as long as its thickness or the combined thickness of the work and the holding fixture does not exceed 14 inches. Although designed expressly for machining jet engine components, both lathes are adaptable for applications in other fields.

The "Air-Gage Tracer" controlled tool-slide is of the swiveling type, and is mounted on a swiveling power angular feed slide. This combination imposes practically no limitation on the direction of tool approach to the work, and thus provides a versatility which is essential for the economical machining of many complex jet engine parts. The power unit of the "Air-Gage Tracer" is mounted on a track at the front of the bed.

The "Air-Gage Tracer" method of duplication from a thin metal template has been applied successfully to hundreds of Monarch lathes doing a wide variety of turning, boring, and facing operations. The continuous, single-tool cut imparts a smooth, stepless finish. The automatic sizing inherent in this method serves to reduce

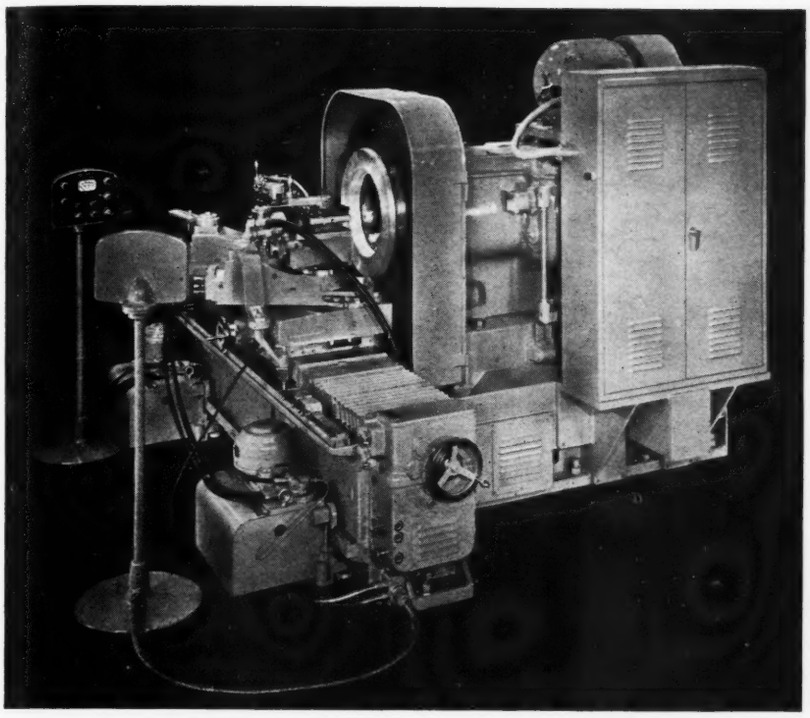


Fig. 2. Monarch Models F and O right-angle lathes can be equipped with air-operated or manually operated chucks. When air-operated chuck is used, a knee-high switch at front of bed permits operator to use both hands for changing work while opening and closing chuck by means of the knee-operated switch.

the chance for human error and practically eliminates spoilage of work. The combination of air gaging and hydraulic slide control is said to insure a very high degree of accuracy. Another advantage of the tracer control is the ease and quickness with which changes in set-up can be made. Air-operated or manually operated chucks can be used, although neither is considered a part of regular equipment. The former type of chuck is frequently recommended, and when it is used, a knee-high pressure switch is provided at the front of the lathe bed, which enables the operator to open and close the chuck jaws, both hands remaining free to change the work-pieces.

Automatic spindle speed control is timed with the tool-slide which travels at a right angle to the spindle. Speed variation, always in a ratio of 8 to 1, is governed by a speed control template. The regular template gives automatic control over a work diameter range of from 32 to 4 inches. Assuming a main drive motor speed of 200 R.P.M. at a diameter of 32 inches, the speed of this motor will be 1600 R.P.M. at a diameter of 4 inches. A template may be furnished to give automatic spindle speed control over larger or smaller diameter ranges. Any modification from the 32-inch to 4-inch range is made only after a study of the work to be done.

Pick-off gears, readily accessible behind a cover on the front of the headstock, provide the desired surface cutting speed. Seventeen sets of these gears are available, covering a range of 125 to 800 feet per minute. Three sets of gears are standard equipment.

The work drive motor of the Model F machine is a 15-H.P. direct-current adjustable speed type with reversing control, dynamic braking, and both automatic and manual speed control. The feed and traverse unit of both Models F and O is individually motor-driven. Two motors of this unit provide power feed or power traverse in either direction at 90 degrees to the spindle, and power feed in either direction to the swiveling compound rest. Power travel on both sides of the spindle center is sufficient for work up to 48 inches in diameter. A gear-box on Model F is mounted at the left of the bed, and on Model O a gear-box is mounted at each end.

The headstock of the Model O lathe is a sixteen-speed helical-gear type with individual motor drive. From the motor mounted on top of the headstock, the drive is by means of multiple V-belts. With the regular 1800-R.P.M. motor, spindle speeds range from 6 to 303 R.P.M. As with the Model F lathe, the headstock position is adjustable over a total travel of 12 inches.

The work drive motor regularly supplied with the Model O machine is a 20-H.P., 1800-R.P.M. constant speed type. Where the work re-

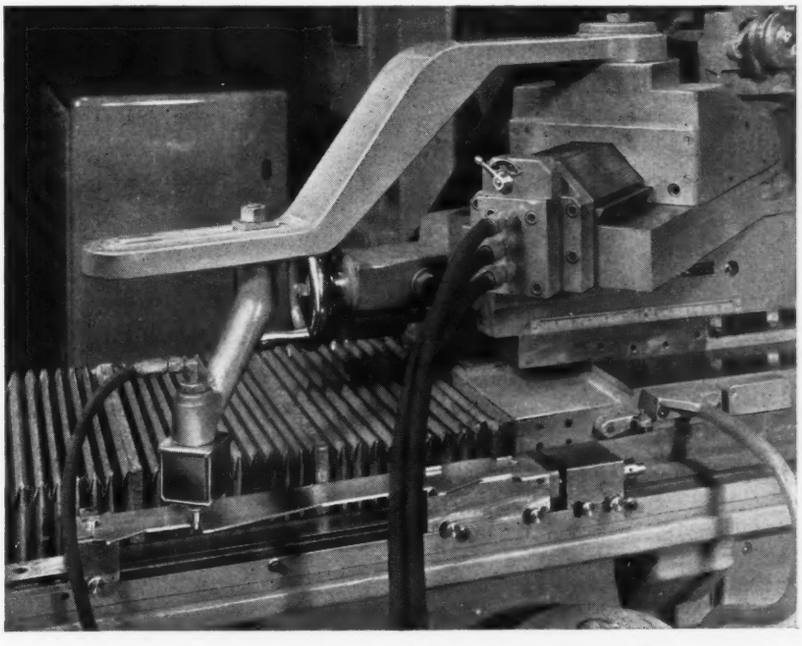


Fig. 3. Close-up view of contour template and accordion type covers for protecting beds of lathes shown in Figs. 1 and 2

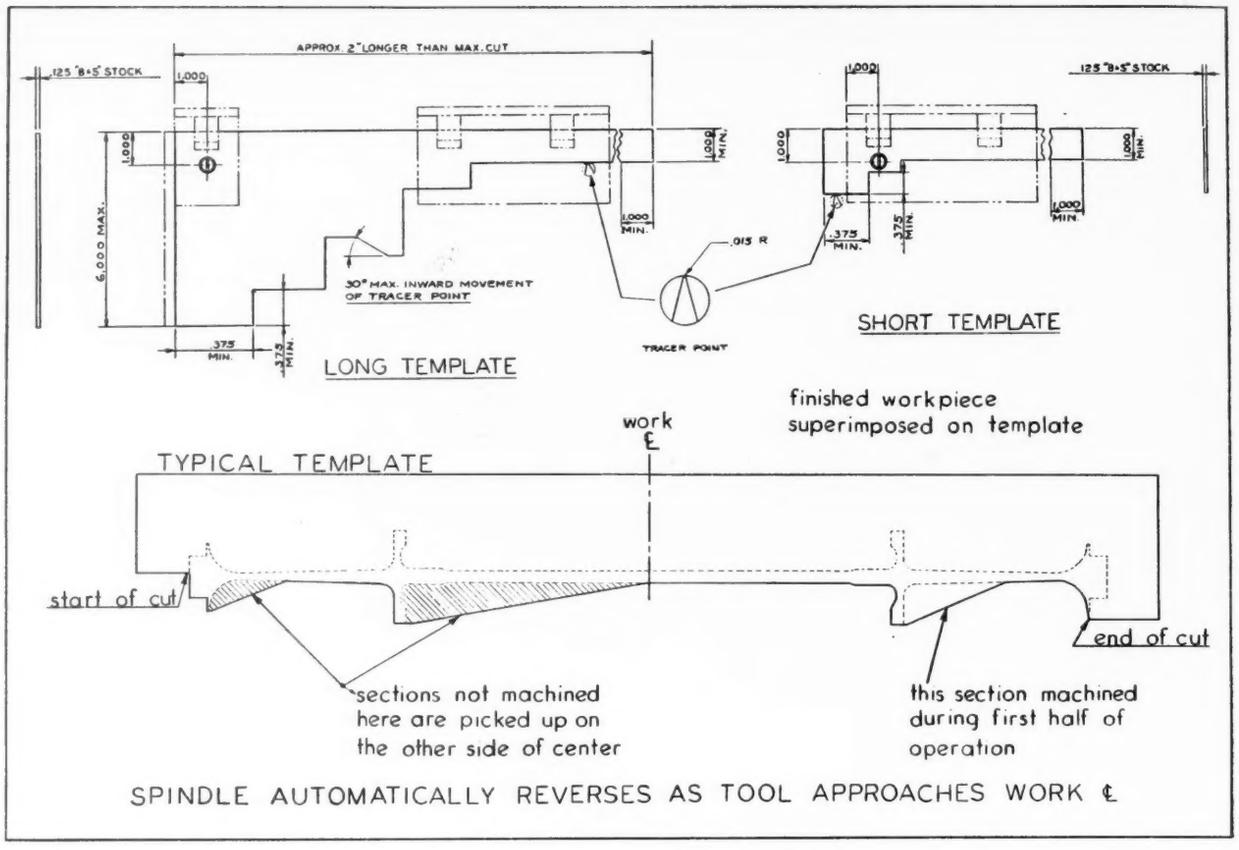

APPROX. 2" LONGER THAN MAX. CUT
.125 "B+S" STOCK
1.000
6.000 MAX.
30° MAX. INWARD MOVEMENT OF TRACER POINT
.375 MIN.
LONG TEMPLATE
.015 R
TRACER POINT
SHORT TEMPLATE
finished workpiece superimposed on template
work ℄
TYPICAL TEMPLATE
start of cut
end of cut
sections not machined here are picked up on the other side of center
this section machined during first half of operation
SPINDLE AUTOMATICALLY REVERSES AS TOOL APPROACHES WORK ℄

Fig. 4. Typical thin metal templates used with "Air-Gage Tracer" on machines shown in Figs. 1 and 2 for automatically duplicating form-turned and faced pieces

quires speeds outside the regular range, a 20-H.P., 500/1500-R.P.M. direct-current motor is used. It provides a range of from 3 to 455 R.P.M. Control equipment consists of a reversing magnetic starter with overload and undervoltage protection and start, stop, and reverse push-button station.

Complete push-button control is an important feature of both machines. The turning cycle is fully automatic. Both longitudinal and angular cross-feeds are infinitely variable. A pedestal type control panel, which may be located for convenient operation, provides push-button control for the headstock spindle and for the traverse and feed motion of the slides. Included on the control panel is a feed meter, calibrated in inches of feed per minute, which provides the operator with a means for varying the feed accurately over certain portions of the cut, should this be advisable in the interest of better finish or longer tool life.

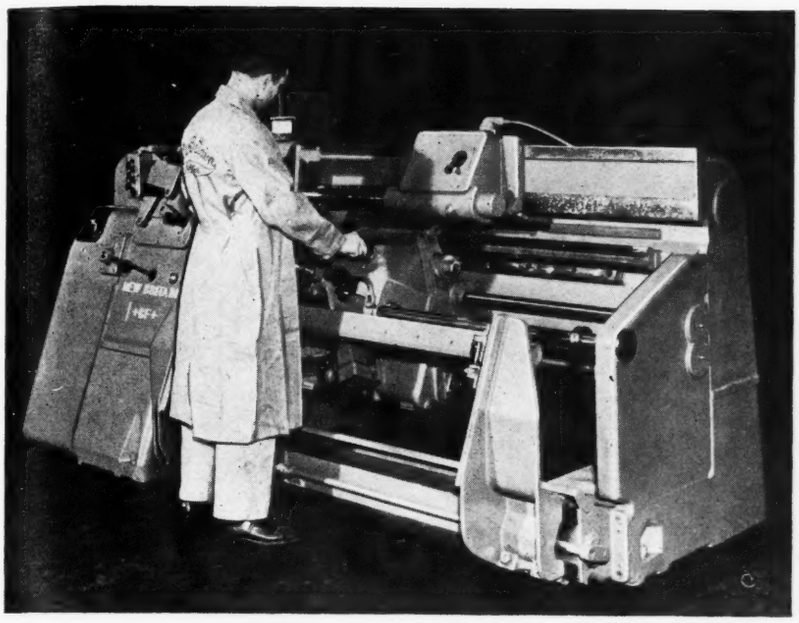
Famco Power Press with Electronic Clutch

The Famco Machine Co., Kenosha, Wis., has just announced a Model 59 "Electromatic" power press which features a new instant-action, electrically operated, nine-point jaw clutch. The clutch —combining the simplicity of electric control and the high efficiency of jaw type clutches—is said to give this 18-ton press added versatility and unprecedented ease of operation. The clutch is activated by simple foot control, or optional hand controls.

The limit switch on the clutch housing provides absolute single-stroke control. A convenient selector switch can be set for either single-stroke non-repeat or continuous operation, without stopping the press. A neutral position locks the clutch in place, regardless of any attempt to operate the foot or hand controls. An electronic timer serves to convert the power press into a fully automatic machine.

A Bijur hand oiling system is available, and may be ordered installed at the factory or added later by the customer. The press is fitted with belt and flywheel guard, and can be furnished with two-hand safety push-button controls if desired.

Famco "Electromatic" power press



Copying lathe of improved design introduced by New Britain Machine Co.

New Britain-Fischer Copying Lathe

The New Britain Machine Co., New Britain, Conn., has announced that the New Britain-Fischer copying lathe will be manufactured at the company's main plant in New Britain and will be available in the United States and Canada. This lathe, originally the product of George Fischer Limited, Schaffhausen, Switzerland, has been under development since 1938. An increase in power input and adaptation to American electrical standards are the outstanding changes incorporated in the improved machine.

Simplicity of operation, low set-up and change-over time, reduced handling and checking time, and elimination of expensive form tools and multi-tool blocks are features developed to enable contour turning and internal copying operations to be performed with greater speed and at reduced costs. There is no conventional flat bed to interfere with the flow of chips to the chip pan beneath the machine. Chips are removed through the rear of the machine without interrupting production. Location of the template on the front of the machine facilitates change-over or adjustment, and places the template in full view of the operator.

The entire hydraulic system, which is of simple design, is enclosed in the carriage. Contact pressure of the tracer against the template is very light, permitting the use of templates cut out of thin unhardened steel. The copying range is increased through the use of a duplex tool-holder, and the copying tool is supported on the whole length of the shank by a tool-holder of great stability. All of these features are said to be of substantial assistance in securing the exceptionally good surface finish and dimensional accuracy obtained with this lathe.

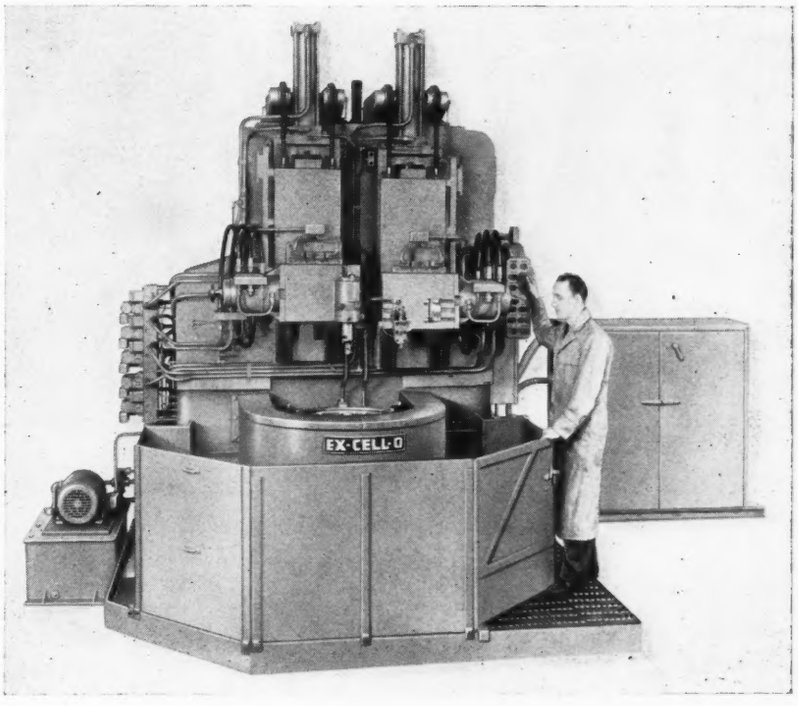
Ex-Cell-O Vertical Precision Boring Machine

The Ex-Cell-O Corporation, Detroit 32, Mich., has developed an automatic vertical precision boring machine, designated Style 425. This massive, heavy machine is designed for multiple precision boring, turning, and facing operations, and is also rugged enough for semi-finishing work. Operations can be performed in a variety of versatile automatic cycles which include automatic changes in work-spindle speeds.

The heavy cast-iron base supports a column on which two vertical slides are mounted. These slides are fully counterweighted and actuated by large hydraulic cylinders to insure smooth operation. Each vertical slide carries a cross-slide which is also powered by large hydraulic cylinders. All slide ways are hardened and precision ground.

Large parts are easily loaded on the 36-inch diameter table, which is supported on a vertical spindle. The spindle is mounted in 24-inch tapered roller bearings, and driven through a precision worm at speeds ranging up to 500 R.P.M. This range includes speeds that are high enough for efficient machining of aluminum.

The dominant feature of this new machine is its versatility. It



Vertical precision boring machine developed by the Ex-Cell-O Corporation

is now being used for multiple finishing operations on large wheels for jet aircraft engine compressors, such as precision boring, counterboring, chamfering, facing, and rabbeting. Functions of the machine which are performed automatically include all slide movements, work speed control, lubrication, and coolant control.

Brown & Sharpe Automatic Screw Machine Designed for Medium-Size Precision Work

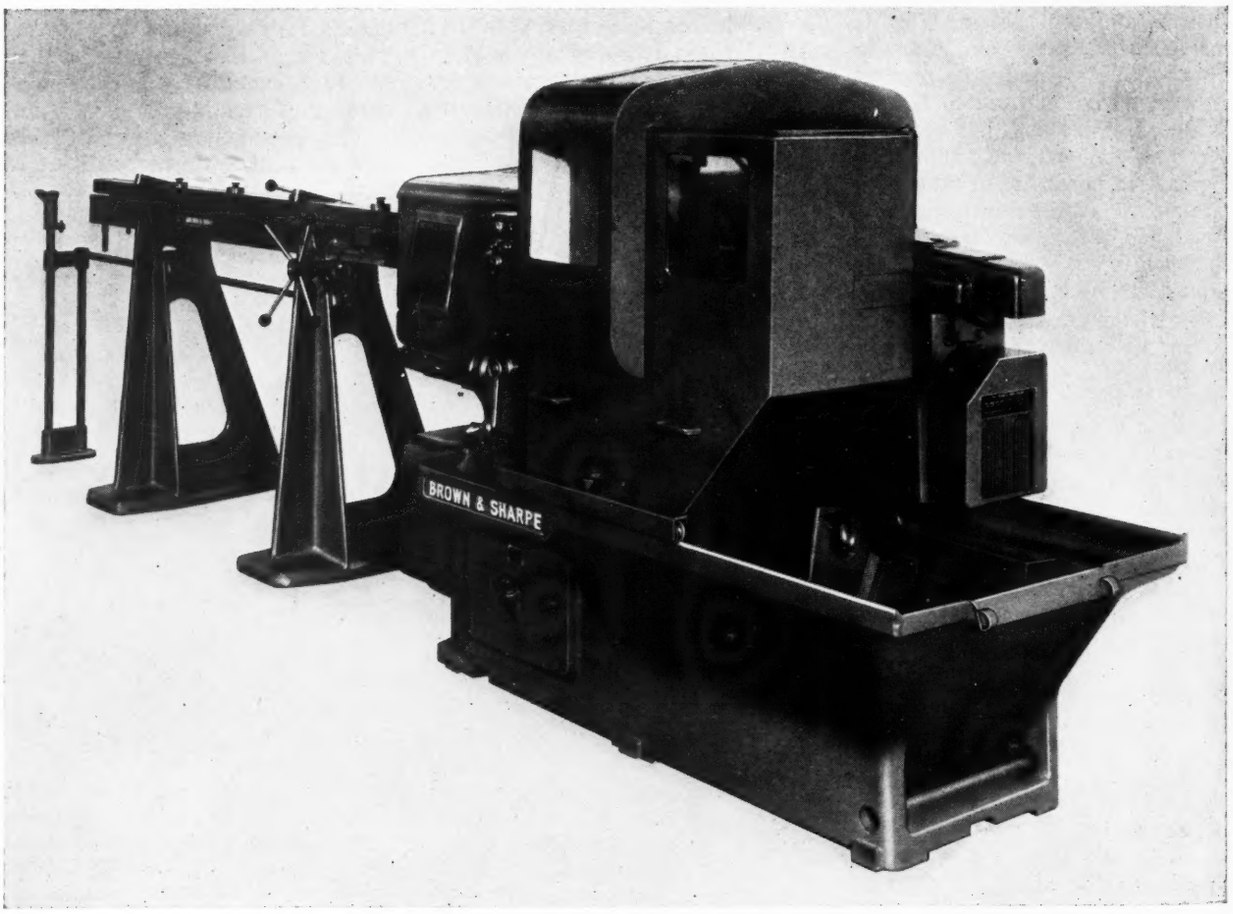
A new No. 4 automatic screw machine designed for rapid, economical production of medium-size work requiring close tolerances combined with fine finish has been announced by the Brown & Sharpe Mfg. Co., Providence 1, R. I. The spindle of this machine has a positive chain drive at all speeds and is provided with 168 two-speed combinations, including a wide range of high to low speed ratios. These two-speed combinations cover a range from 1965 to 17 R.P.M. All but the six combinations giving the highest speeds can be used for forward or backward rotation. This wide range of speed ratios is designed to make possible equal cutting efficiency on materials ranging from tough alloy steels to free-cutting plastics and in a wide range of work diameters.

The machine is especially adapted for the production of precision parts for cameras, automobiles, business machines, time fuses, and a large variety of defense items. Production rates range from twelve seconds to thirteen minutes per piece. It will regularly handle work up to 1 1/2 inches in diameter. Where the nature of the work permits, it will handle round stock up to 2 inches in diameter (up to 2 3/8 inches in diameter with outside feed) and hexagonal stock up to 1 3/4 inches across flats.

A single movement of the feeding mechanism feeds the work any length up to 6 inches and greater lengths can be fed by successive movements. Movement of the turret-slide permits turning any length up to 5 inches. The greatest distance from the face of the collet to the turret is 7 7/8 inches and the minimum distance 2 7/8 inches.

The spindle is driven by a 10-H.P. constant-speed fan-cooled ball-bearing motor mounted at the rear of the machine under the electrical control compartment. The operating mechanisms of the machine are driven by a 1/2-H.P. constant-speed ball bearing motor with built-in disc type brakes. The automatic lubricating system and the pump which operates the coolant system are driven by a single 1/3-H.P. motor.

The flat face type turret is 13 inches in diameter, and is designed to permit the tools to be clamped directly to the turret face. The turret revolves vertically on the front side of the turret slide. It is withdrawn to a uniform position at the start of the indexing movement and returned to the



Automatic screw machine designed for close tolerance work of medium size, brought out by the Brown & Sharpe Mfg. Co.

working position when indexing is completed independently of the action of the lead cam. The turret is located after indexing by an automatically operated hardened taper pin. The entire indexing cycle is completed in two seconds. The feed of the turret-slide is controlled by a lead cam made from a steel disc which can be easily formed and quickly applied to the left-hand end of the camshaft at the front of the machine.

The feeds for the independent front and rear cross-slides are controlled by independent cams made from steel discs which can be easily formed and applied. Each cross-slide has transverse adjustment, with the dial graduated to 0.001 inch. A vertical slide is also provided which is used primarily with a cutting-off tool. This slide is operated by a cam on the shaft at the front of the machine and has an adjustable positive stop.

The machine requires a floor space, including stock loaders, of 70 by 244 inches. It weighs approximately 6100 pounds without the coolant splash guard or stock loader. The splash guard weighs approximately 210 pounds and the stock loader 1100 pounds.

Dayton-Rogers Die Cushions

Greater strength is an outstanding feature claimed for a new line of die cushions announced by the Dayton Rogers Mfg. Co., 2829 13th Ave. S., Minneapolis 7, Minn. Each size die cushion in this line is designed to keep the weight at a minimum, while reinforcing all critical stressed sections. A fully hardened and ground pin pressure pad which fits the press bed opening is designed to assure accurate alignment at all times.

All semi-steel die cushions have uniform grain structure and high tensile strength. These units can be fastened directly to the bolster plate or provided with a mounting plate whereby they can be installed on the press bed. The press bed mounting has the advantage of allowing the bolster plate to be removed without disturbing the cushion installation.

The unit comes ready to install with a combination reducing regulating valve and pressure gage. All cushions operate from standard air pressure available from the average shop air line.

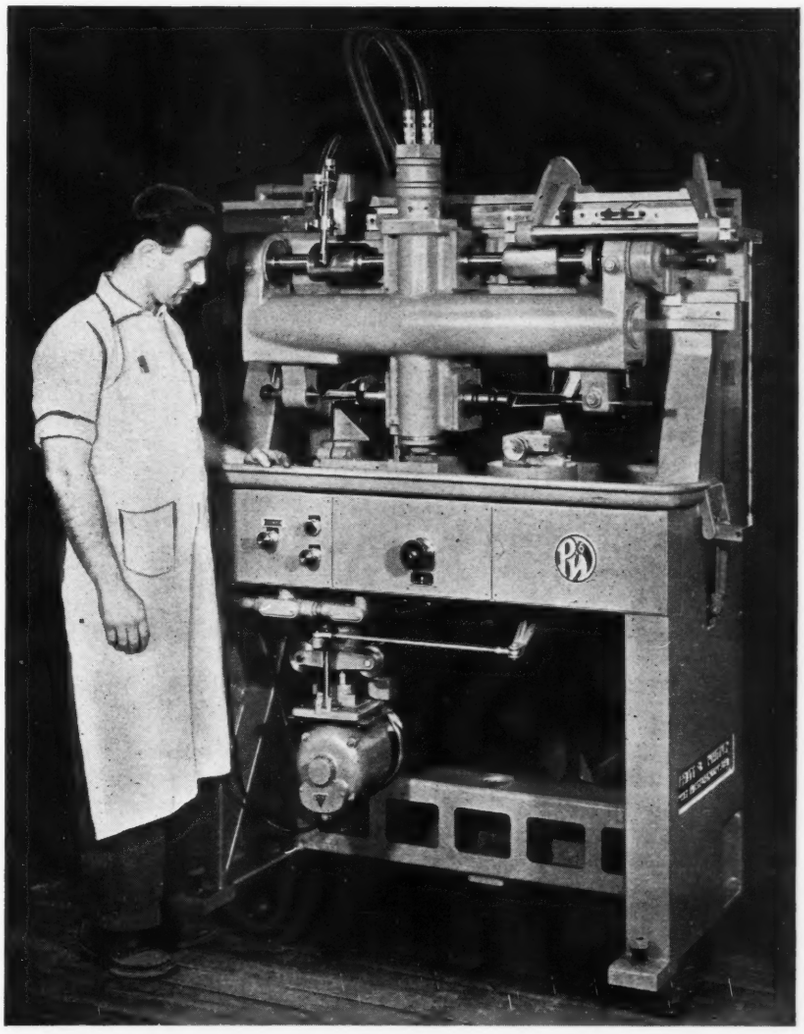


Fig. 1. Automatic machine for grinding jet blade airfoils developed by Pratt & Whitney

Pratt & Whitney Automatic Machine Designed to Grind Jet Blade Airfoils

Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., has developed a new automatic grinder for finish sizing with uniform accuracy all irregular and twisted airfoil sections of jet engine compressor blades and turbine buckets. With this machine the complete airfoil section —including the important leading and trailing edges, and the area close to angular roots or shrouds— is ground in a single automatic cycle. One operator, tending a battery of these machines, has only to unload the finished blade, replace it with a forged or fabricated blade blank, and restart the cycle. Thus high production of work held to close tolerances is achieved at comparatively low cost.

The turbine blade airfoil grinder operates on the duplicating principle, copying from an airfoil master. The master is an exact duplicate of the blade shape desired, except for a uniform envelope of material which is added to stiffen it against deflection. Stock is removed from the work by a high-speed coated abrasive belt which runs over a small grinding contact wheel. This method of using an abrasive belt for precision grinding is employed to eliminate the difficult problem of maintaining proper grinding wheel and tracer wheel size relationship, and in addition, to provide a large grinding surface despite the necessary small-diameter contact wheels needed to grind the concave surface of the airfoil. It also has the advantage of eliminating dressing and truing operations.

This automatic grinder has a

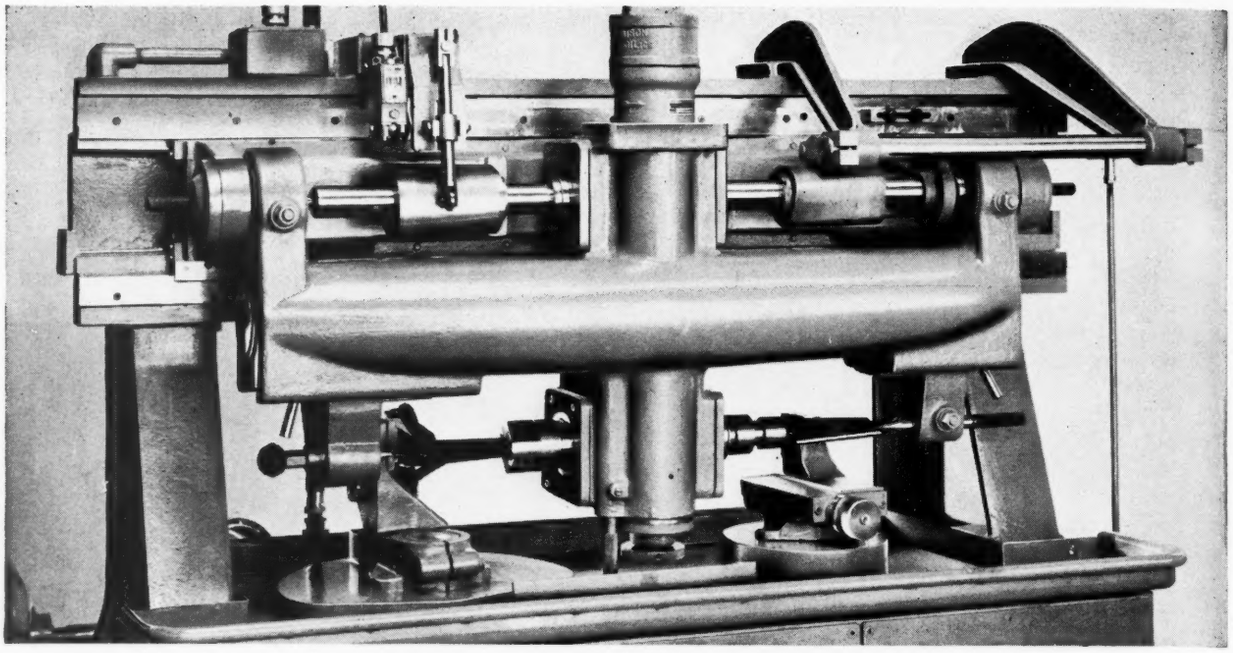


Fig. 2. Close-up view of machine shown in Fig. 1 with jet blade and master in place

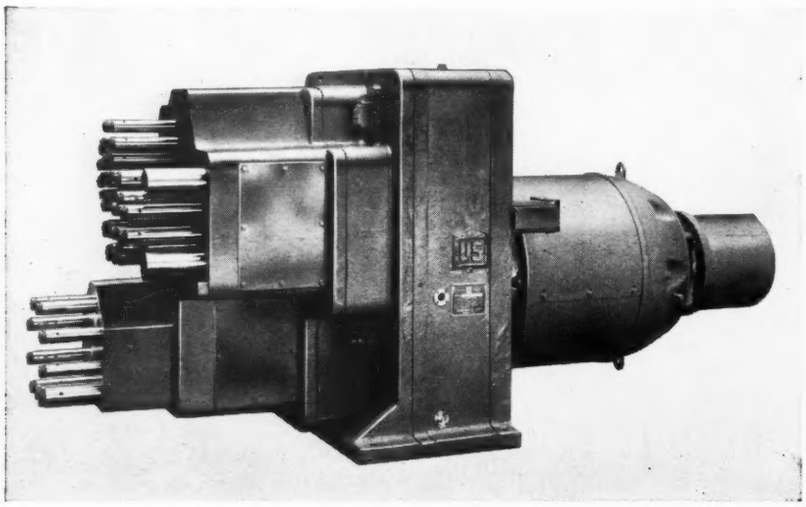
main frame, at the top of which a pivoting work frame is suspended from a traversing carriage. A center horizontal beam carries a fixed master follower roll and the grinding belt unit. As the work and master rotate simultaneously, the master—resting against the follower roll—moves the work frame in and out, and causes the grinding contact wheel to duplicate the shape in the work.

The rotational speed of the work is automatically varied so that the leading and trailing edges of the blade pass the grinding surface at a faster rate than do the concave and convex surfaces. In order to keep the surface of the grinding belt presented to the work in a position normal to the twisted foil at all times, the grinding belt wheel is given a swiveling motion by means of a cam mechanism. As the work-piece rotates, it is traversed lengthwise across the contact surface of the grinding belt. A compound motion is added at the end of the traverse pass when grinding blades that have angular roots or shrouds. A roughing pass removes from 0.002 to 0.006 inch of material on a side during each traverse, and a finishing pass removes 0.001 inch per side. A rough-milled blade blank with a maximum envelope of 0.010 inch is ordinarily finished in four traverses.

Individual Lead-Screw Tapping Head for Three-Way Machine

The United States Drill Head Co., Cincinnati, Ohio, has recently designed and built a special tapping head to operate in conjunction with two additional lead-screw tapping heads on a three-way machine. The special tapping head has individual lead-screws designed to tap holes with fine or coarse threads and small or large diameters simultaneously, regardless of the differences in the threads. This is made possible by providing each tap with its own lead-screw, the lead of which is identical with the lead of the tap.

The particular head illustrated taps a range of taper pipe holes from 5/16 inch 18 threads per inch to 3/4 inch 14 threads per inch in an aluminum accessory case that requires Class three threads. The stroke of the spindles varies with the requirements of each hole to be tapped, the maximum stroke being 3 1/8 inches. A rotary type limit switch reduces the stroke and thus speeds up production to an estimated rate of ninety-seven pieces per hour.



Individual lead-screw tapping head built by United States Drill Head Co.

The machine stops automatically when the tapping operation is completed and the heads have returned to their original positions.

Pines Aircraft Tube Bender

A 3/4-inch tube-bending machine intended primarily for the aircraft field is now being built by the Pines Engineering Co., 601 Walnut St., Aurora, Ill. It occupies 30 per cent less floor space than former units. The operating circuit of this machine is designed to permit individual control of all functions at any time during the cycle. An additional push-button control panel enables the operator to stop, start, or reverse the cycle at any given point. This permits tooling results to be checked at any operating position. A workpiece can be formed, checked, and quickly replaced in the bender for an additional two or three degrees of bend.

The new circuit control is said to save time in bending individual pieces on short or test runs, as well as to increase the efficiency of production run set-ups. Another important feature is a pick-off angle-of-bend turret which can be removed from the machine and stored like other tooling until needed for a repeat run. In a similar manner, the location-of-bend stop assembly is designed for easy removal.

The bender will handle 1-inch 16-gage stainless-steel tubing; I.P.S. extra heavy pipe in sizes up to 3/4 inch; and 1 1/4-inch nonferrous metal tubing with a wall thickness of 0.134 inch, as well as extruded shapes within its capacity range. The maximum standard radius adjustment is 10 inches.

Pines aircraft tube-bending machine of improved design

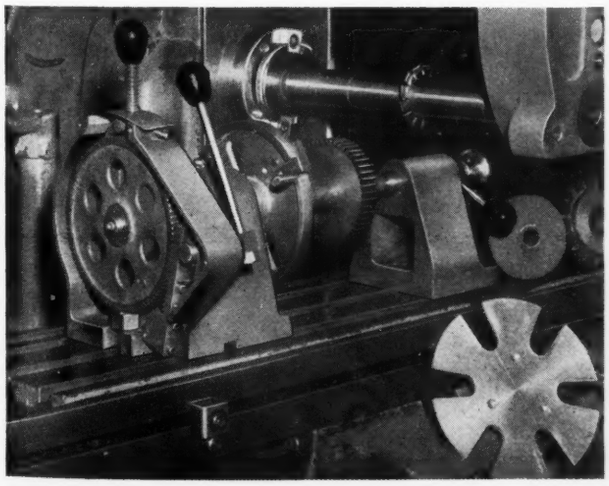
"Hi-Speed" Indexing Head

A "Hi-Speed" precision indexing head intended for production as well as tool-room work has been brought out by A. C. Willbrand, 627 Orwood Place, Syracuse, N. Y. This indexing head can be easily operated by unskilled help since spacing is obtained by merely manipulating two levers against stops.

It will make any number of divisions up to 100, and can be used parallel or at right angles to the milling machine table, or mounted vertically for drilling or milling. The No. 2 Morse taper spindle can be furnished with collets, chuck, or faceplate. Weight of head is 46 pounds.

G-E Portable Surface-Resistance Indicator

A portable surface-resistance indicator to help produce a better resistance welding bond by providing a rapid and accurate measurement of the resistance between pieces of metal to be welded, has



Indexing head designed for rapid operation built by A. C. Willbrand

Surface resistance indicator for welding shop announced by General Electric Co.

been announced by the Special Products Division, General Electric Co., Schenectady 5, N. Y. The new device has been developed to supply a simple check on pre-welding cleaning processes, upon which the surface resistance of the metal depends. It will detect small changes in concentration or slight contamination of cleaning solutions which cause surface resistance to vary widely, and which ultimately result in an unsatisfactory resistance welding bond.

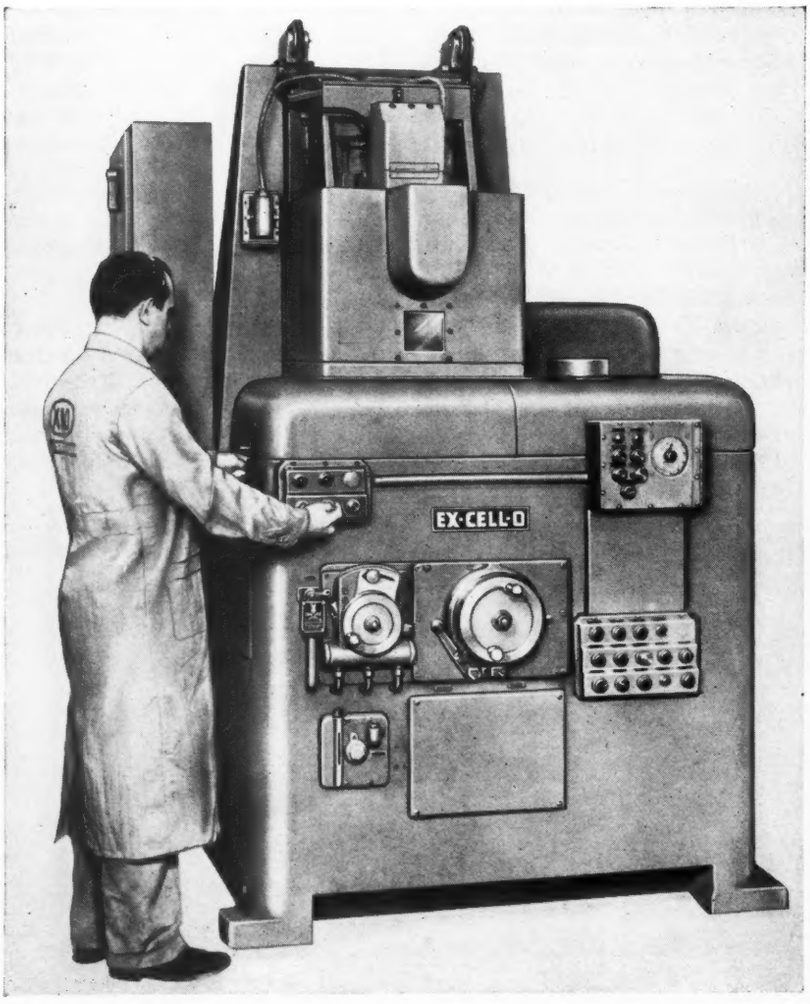
Ex-Cell-O Machine Designed to Grind Flat, Grooved, or Curved Surfaces on Jet Engine Blades and Buckets

Style 84 precision surface form grinder is a new addition to the line of standard blade finishing machines made by the Ex-Cell-O Corporation, Detroit 32, Mich. This machine is said to have been thoroughly tested by three years of actual production work. It will grind flat, grooved, or curved surfaces on the roots of jet engine compressor blades and turbine buckets, employing a fully automatic machining cycle. The machine is especially designed to insure accurate work and a good finish. The reciprocating work-table is hydraulically operated and electrically controlled. It accommodates removable work fixtures designed to suit the individual blades or buckets and to permit the work to be left in these fixtures for subsequent operations.

A short, rigid column supports the spindle slide. The grinding spindle is mounted horizontally and is adjustable endwise to allow the preformed wheels to be in correct relationship to the dresser. A motor mounted on the machine base drives the spindle through V-belts. The desired wheel speeds are obtained by changing belts and pulleys.

A motor-driven, cam type diamond dresser is used to give the grinding wheel the desired form. The dresser is mounted above the wheel spindle, where it is readily accessible for changing or adjusting the truing diamonds or the profile cams. Dressing is part of the automatic machine cycle, but the dresser also may be controlled manually when setting up a new wheel or adjusting the cam.

All controls are at the front of the machine within easy reach. A central handwheel controls the grinding size. A coarse feed for quick set-up and also a fine feed for accurate sizing are available. Automatic feed to the finish size and retraction are part of the machine cycle.



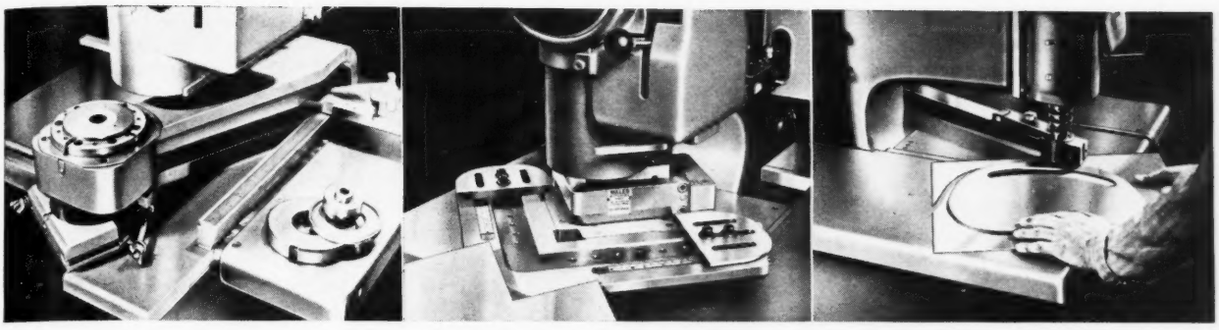
Machine for grinding jet engine blades and buckets, built by the Ex-Cell-O Corporation

Interchangeable Punches and Dies for Wales Sheet Metal Fabricators

A holder for use with interchangeable punches and dies on Wales sheet metal fabricators has just been made by the Wales-Strippit Corporation, 375 Payne Ave., North Tonawanda, N. Y. This Wales 3 1/2 holder is designed to fit into the bed channel, and does not have to be removed from the fabricator during the interchanging of punches and dies.

Rapid set-ups and, therefore, faster output of parts requiring larger diameter holes are made possible by this holder, which can be used for punching round holes up to 3 1/2 inches in diameter, as well as shaped holes of comparable size. The holder is a machined aluminum casting designed for lighter weight and quicker, easier handling. A steel bushing in the punch guide hole of the holder head accurately guides the punches and dies.

One of the many outstanding features of the Wales fabricators is the "Hydra-New-Matic" head, which operates at a speed of 165 strokes a minute with a minimum of vibration and noise. A full-floating drive-shaft construction places the ram load, by means of main bearings, directly on the frame proper, eliminating all bending stress on the drive-shaft. Dual control of the ram strokes is provided by an adjustable foot trip mechan-



(Left) New Wales holder shown with die-head partially opened for interchanging various dies. Interchangeable punches and dies are seen on table at right. (Center) Type "NG" notching units with adjustable gages mounted in the Wales fabricator. (Right) Fabricator set up for nibbling around outside of guide plate. Inside nibbling is accomplished in the same manner.

ism for use when both of the operator's hands are required to feed work, or when large sheets make it awkward to use the hand trip lever.

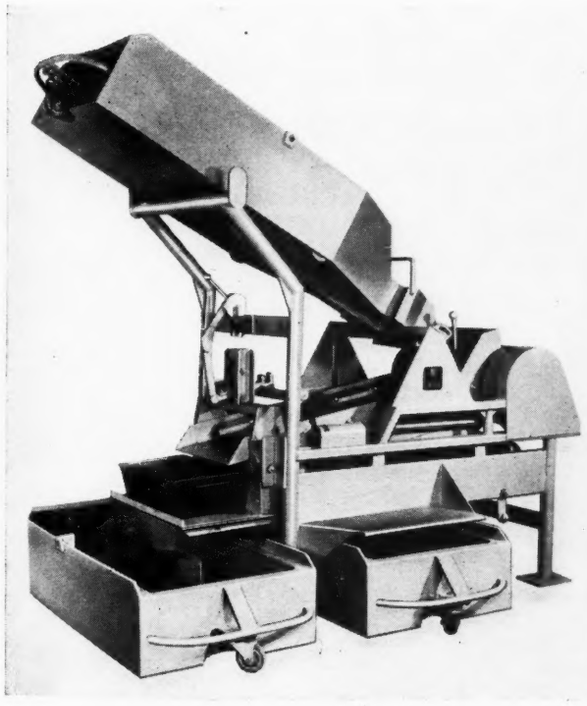
Machine for Separating Parts and Chips

A new machine designed for the removal of parts from deburring and finishing chips, and for grading different sizes of chips is now being offered by the Grav-i-Flo Corporation, 400 Norwood Ave., Sturgis, Mich. Improved features claimed for this machine include greater compactness, which is attained by locating the hopper at the top of the machine; separation of parts effected without damage; and the provision of a two-deck carriage which permits grading three sizes of chips at one time.

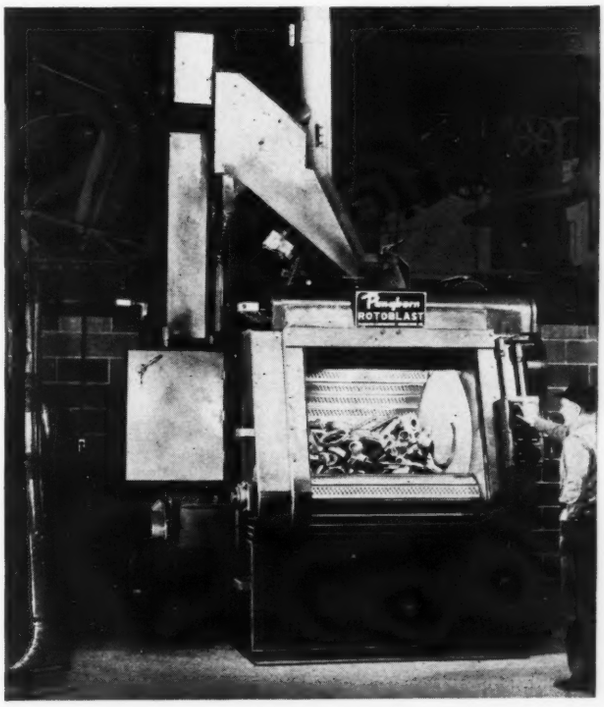
The machine is quickly converted to chip grading by the simple turn of a cam which raises the lower end of the carriage off its rollers, and creates the same eccentric action as is provided at the back of the machine. The result is a uniform throw over the entire length of the two-deck screen carriage, permitting an accurate grading of chips. Screens for various sizes of chips are available. The separator has a 3/4-H.P. variable-speed drive.

Pangborn Airless "Rotoblast" Barrel

The Pangborn Corporation, 1200 Pangborn Blvd., Hagerstown, Md., has brought out a "Rotoblast" barrel for cleaning small parts. This equipment is designed to increase production and lower costs while maintaining high cleaning efficiency. It is available in two sizes, having capacities of 6 and 12 cubic feet, respectively. A new work conveyor driven by a hardened steel chain has special cast-iron slats so designed that they will not pinch the work. The iron slats also prevent wire or other scrap from entering the chain track.



Separator introduced by the Grav-i-Flo Corporation

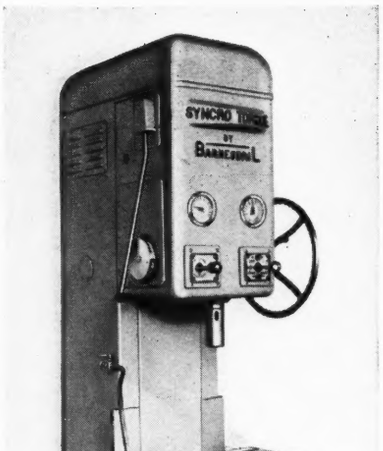


Airless "Rotoblast" barrel for cleaning small parts

The drive is by means of V-belts to a spur gear reducer on the work conveyor shaft. When the barrel is operating, the work is tumbled by the upward traveling conveyor. As soon as the cleaning operation is completed, the direction of the conveyor travel is reversed and the work is discharged into the loader. The barrel drive is automatically disengaged in case a jam occurs when the conveyor is operating in either the loading or the unloading direction.

The abrasive-tight door of woven wire mesh backed with vulcanized rubber, slides on rollers. By operating a crank, the door can be rolled up compactly out of the way to give easy access to the cleaning chamber. The door can be held at any position by a positive brake. An efficient cleaning and reclaiming system is provided to remove all sand and debris in order to maintain the abrasive at its full operating efficiency. The volume of abrasive flow is controlled by an orifice plate.

A quick-acting work loader, with double cables for safety, delivers the entire load into the machine. The unit is driven by a 1/2-H.P. motor. The smaller unit is 6 feet 8 inches deep, 6 feet wide, and 13 feet 9 7/8 inches high, while the larger unit is 7 feet 9 inches deep, 9 feet 7 inches wide, and 14 feet 6 inches high.



Production drilling machine with "Syncro-Torque" drive

Barnes Drilling Machine with "Syncro-Torque" Drive

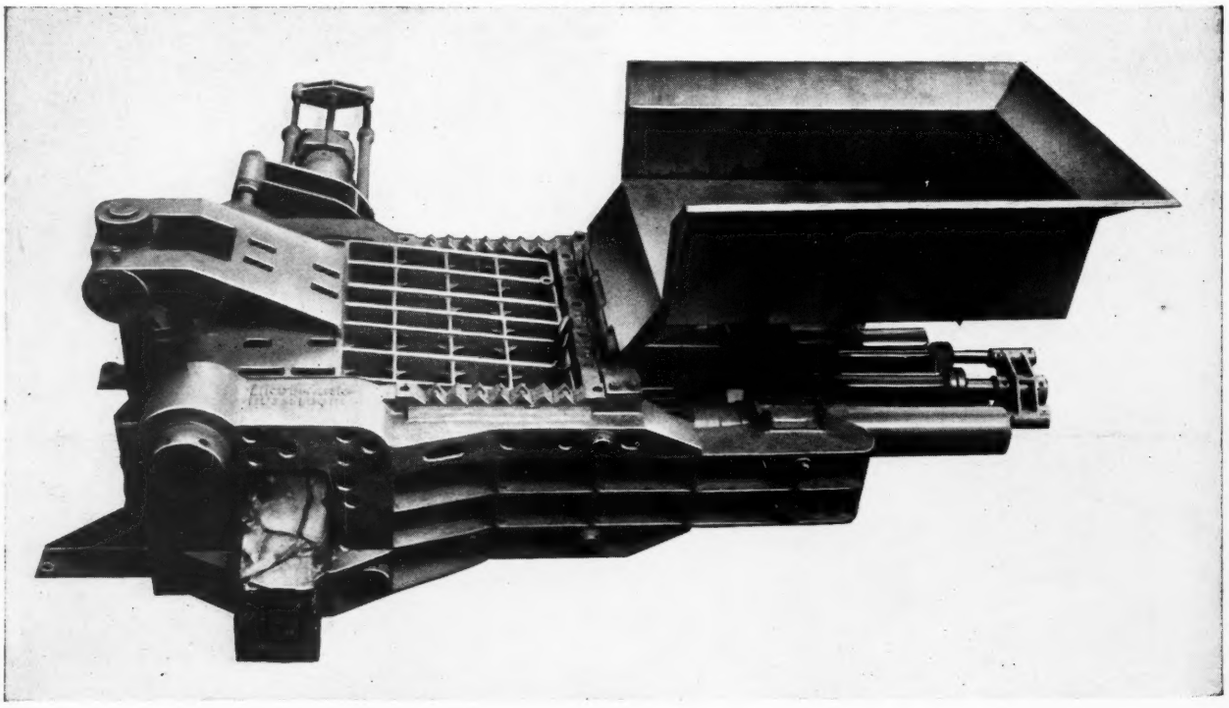
A new drilling machine, designed to simplify setting-up and speed drilling operations, is announced by the Barnes Drill Co., 820 Chestnut St., Rockford, Ill. This machine is of sturdy, rugged construction throughout and features the new Barnesdril "Syncro-Torque" drive which provides constant full-rate horsepower delivery under all conditions of speeds and feeds. With this drive the user has instantly available a wide range of infinitely variable feeds and speeds at full power capacity.

The first machine in this new line has a 21-inch swing and a 1 1/4-inch drilling capacity in steel. It will be shown for the first time at the Canadian International Trade Fair, to be held in Toronto, Canada, from June 2 to 18.

Lindemann Scrap Baling Presses

High-capacity scrap baling presses built in two basic designs —the shearing ram type and the pressing lid type—are being introduced on the market by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. They are products of Lindemann Maschinenfabrik, Duesseldorf, Germany.

The shearing ram type, "SE" series, is designed for continuous feeding, and is readily adaptable to fully automatic operation. Scrap is fed into the press box, and two yoked half-pressure rams move



Lindemann scrap baling press equipped with feed hopper, introduced by the Kurt Orban Co., Inc.

forward to shear off any scrap above the level of the ram and to effect the first compression. This sheared-off scrap remains on the cover plate of the half-pressure rams. Protruding pieces of scrap are cut off between blades, and the scrap is pressed into the chamber, where it receives the final compressions, after which it is ejected onto a slide or conveyor belt. Models for iron and steel scrap have bale capacities ranging from 80 to 950 pounds.

The "SA" and "SI" series are of the triple-compression type, and are provided with feed hoppers. The "SA" series press shown in the accompanying illustration is designed to cut baling costs at open-hearth steel plants, and will produce bales weighing up to 8800 pounds at an output rate of twenty bales per hour. The feeding hopper receives sufficient scrap for a new bale while the preceding bale is being pressed.

The "SI" series is intended for heavy-duty pressing of smaller scrap bales, and is adaptable to the requirements of blast and electric furnaces, automobile body works, and metal-working plants. The smallest model produces 265-pound bales, the largest, 800-pound bales.

Wade Improved Precision Profiling Machine

Several new features have been embodied in the improved motor-driven precision profiler manufactured by the Wade Tool Co., Waltham, Mass. This machine is much heavier than the preceding model and is equipped with a powerful V-belt drive. While it is supplied for bench mounting, it can be had with a pedestal metal cabinet as optional equipment. Duplicate collets of improved design are used on the cutter and follower spindles. The follower spindle is parallel with the main spindle and will take a cutter which can be used to produce templates from work-pieces.

This machine is especially designed for profiling, milling, slotting, recessing, and routing operations on small mechanical parts. It is being used for precision work on watch and clock plates and mechanisms; mechanical time fuses; and parts for small firearms; small textile machinery parts; meters and dial indicators; typewriter and adding machine plates and levers; optical instrument parts; camera parts; and small cams of all kinds.

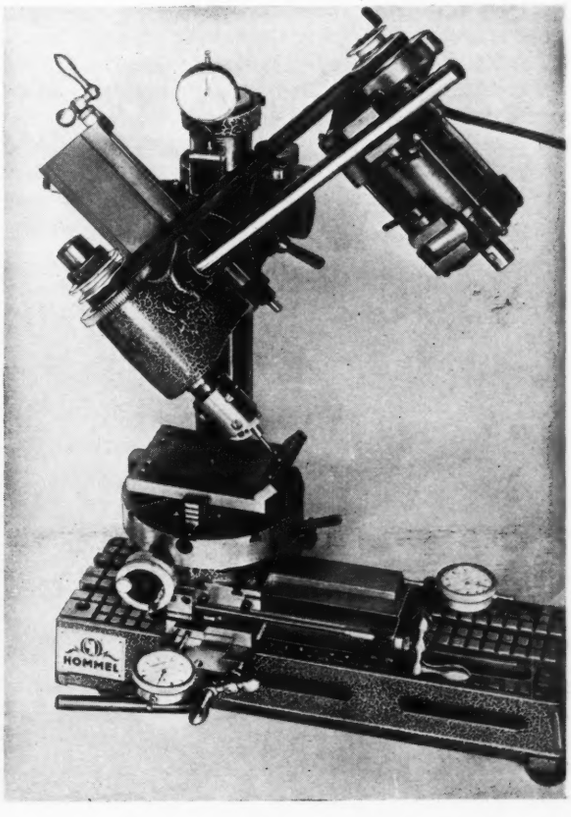
The machine requires a floor space of only 24 by 26 inches, and is 57 inches high. A standard 1750-R.P.M. 1/3-H.P. three-phase motor provides eight spindle speeds, ranging from 437 to 7000 R.P.M. A 3450-R.P.M. 1/3-H.P. three-phase motor can be had which gives eight spindle speeds, ranging from 875 to 14,000 R.P.M. The horizontal working area is 2 by 4 inches, and the vertical area 1 1/4 inches.

Hommel Universal Multi-Purpose Machine

The Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y., is introducing in this country a Hommel universal multi-purpose machine designed to facilitate machining several sides or surfaces of a complicated work-piece without changing its original setting. A large number of special attachments and tools are available for use in performing such operations as precision turning, facing, milling, grinding, drilling, planing, jig boring, polishing, and slotting.

The baseplate is set on rubber feet, and can be used both as a

Wade improved precision profiling machine



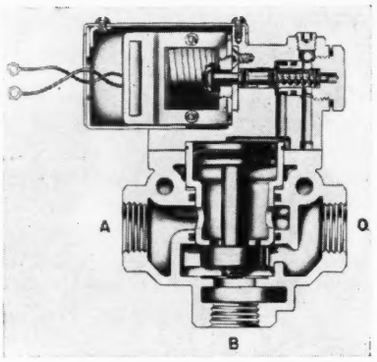
Hommel universal multi-purpose machine

tracing plate and a measuring table. The spindle and driving unit can be set in any desired angular position. Twenty-five spindle speeds are available. The spindle headstock has self-adjusting precision roller bearings. In the illustration, the Hommel universal multi-purpose machine is shown set up as a jig borer.

Special Furnace for Heating Aluminum Bars

In response to requests from the aircraft industry for a furnace adapted for heating special aluminum bars to approximately 300 degrees F. prior to forming operations, the Pereny Equipment Co., Columbus, Ohio, has just introduced a new portable electric furnace. This unit has an oven 3 feet wide by 6 feet long by 8 inches high. It is equipped with a blower which provides proper recirculation of the heated air, and has an asbestos strip curtain that partly closes the openings through which the long bars are fed into the furnace and discharged from it. The unit is mounted on rollers so that it can be transported to the machine or equipment that is to perform the next operation.

The complete unit is 74 inches high by 72 inches wide by 36 inches deep. Controls include temperature indicator, instrument transformer, magnetic contactor, switch box, and motor starter. The strip heating elements are of the fin type. The furnace operates on a 36-K.W., 440-volt current.



Cross-sectional view of new Hannifin air control valve

New Hannifin Air Control Valve

A "Pilot-Master" valve designed for versatility and reduced maintenance costs has just been introduced by the Hannifin Corporation, 1110 S. Kilbourn Ave., Chicago 24, Ill. The main (or master) valve section can be operated either two-way or three-way, normally open to pressure or normally closed to pressure, without any internal change whatever. This is made possible by having the inlet and exhaust ports interchangeable.

Referring to the illustration, port *A* is the inlet for normally closed operation and the exhaust port for normally open use, while port *B* is the inlet for normally open use and the exhaust for normally closed operation. The simple insertion of a pipe plug in the "exhaust" port (either *A* or *B*) converts the valve for two-way use. In any case, port *O* (at the right) is normally the outlet to an air cylinder.

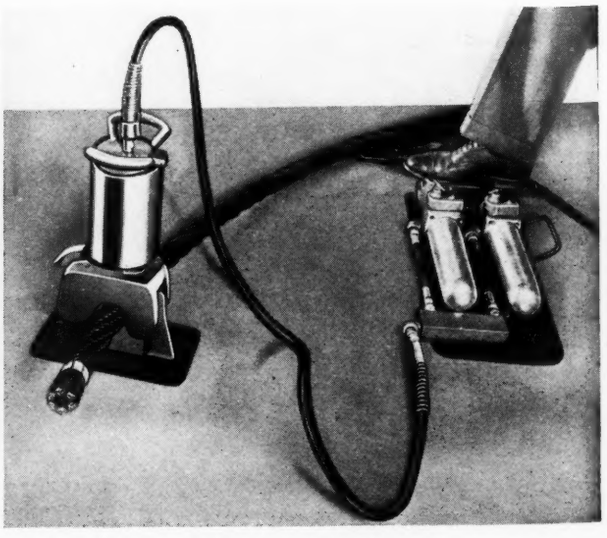
Only two sizes of cartridge-and-piston poppet assemblies are needed to service all five main valve body sizes, from 3/8 inch to 1 1/4 inches I.P.S. Similarly, one size of pilot head fits all five sizes of master valve in this "Pilot-Master" combination. On 60-cycle current the valve will shift in less than 1/20 of a second. The valve can also be supplied with direct-current solenoid.

Portable Wire Rope Cutter

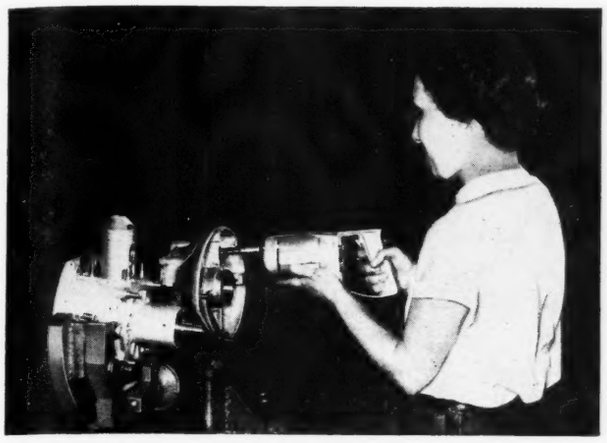
A new latch type wire rope cutter has been developed by the Manco Mfg. Co., Bradley, Ill., to supplement its line of guillotine metal cutting equipment. Wire rope up to 1 3/4 inches in diameter can be easily cut on this new Series 15 guillotine cutter. Tripping a latch opens the anvil by causing the main body of the tool to tilt to one side. The material to be cut is then laid in place, and the main body of the tool is raised to its original vertical position, in which it is automatically locked. Cutting of the rope is then quickly accomplished by applying hydraulic pressure.

The basic cutting unit is available with a variety of electric and air-hydraulic pump assemblies, including equipment for foot-lever and remote control operation. The weight of the complete unit is about 75 pounds.

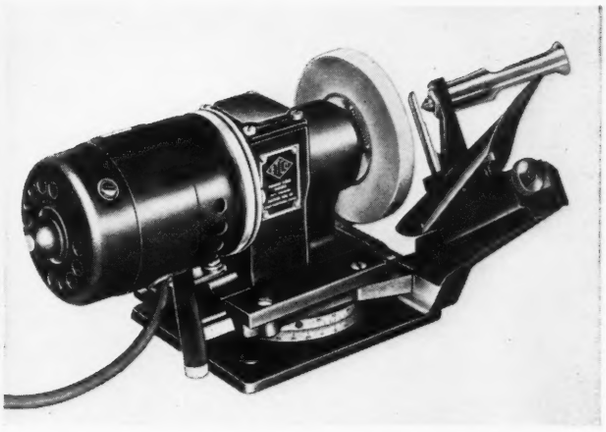
Furnace for heating aluminum bars introduced by the Pereny Equipment Co.



Portable wire rope cutter placed on the market by the Manco Mfg. Co.



Portable electric drill in wide range of free speeds introduced by Mall Tool Co.



Machine brought out by the Eastern Tool Co. for accurate dressing of diamond wheels

Mall Electric Drills

Portable electric drills designed to meet production line requirements are being introduced by the Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill. These 1/4-inch capacity drills offer a choice of seven free drilling speeds ranging from 600 to 5000 R.P.M. They are available in pistol grip, spade handle, and center contour handle styles.

Operating freedom is gained through compact size and a weight of only 3 1/2 to 4 pounds. The lightweight aluminum construction of these drills, coupled with balanced armatures and precision matched gears, is said to reduce tiring vibrations. All three models feature universal type AC-DC motors, and can be had for operation on either 115- or 230-volt, 25- to 60-cycle current.

Diamond Wheel Dressing Machine

The Eastern Tool Co., East Hartford, Conn., has just placed on the market a new diamond wheel dressing machine designed to prolong the life of any diamond wheel. This machine is easily mounted on a work-table for radii, periphery, and angular truing of wheels within extremely close limits of accuracy. Double- and single-row bearings are used to insure a true running wheel. A vernier scale is provided for quick, precise angle setting.

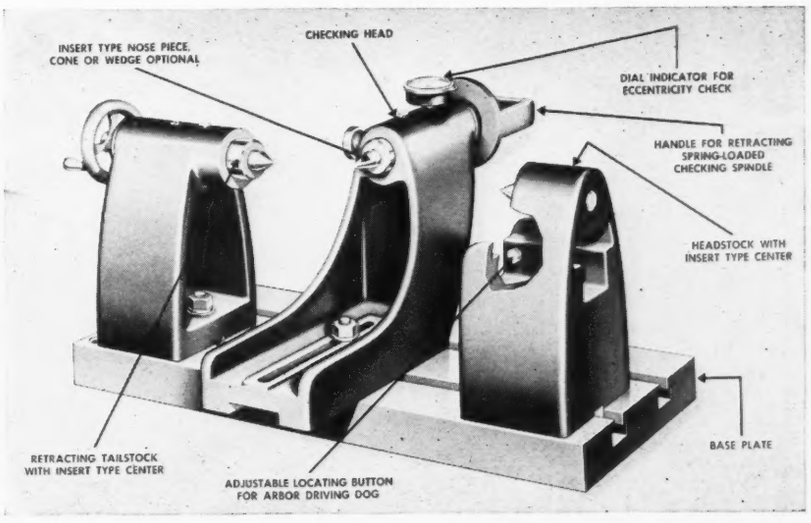
"Red Ring" Stock Divider for Gears

The National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., has brought out a stock divider to facilitate accurate setting up of gears preparatory to grinding. This device can be used to determine precisely the amount of eccentricity in the gear to be ground, as well as locate the high point on the pitch circle. Using the data thus obtained, the gear can be clamped on its arbor so that an equal amount of stock will be presented to the grinding wheel on each side of the high point.

The dividing operation can, of course, be performed on the gear grinding machine, but this practice has the disadvantage of causing idle machine time. The stock divider allows the machine operator to clamp a gear on the arbor while its predecessor is being ground. Thus the only idle time for the grinder is that required for unloading and reloading.

Cullman Time-Saving Sprockets

Technical ingenuity in the field of power transmission is demonstrated in a "semi-stock" sprocket just announced by the Cullman Wheel Co., Chicago 14, Ill. The sprockets in this new line are designed to convert sprockets previously made to order into "off-the-shelf" stock items. By welding one or two hubs to a Cullman semi-stock Type A sprocket, it can be converted into a Type B or Type C sprocket. Finish-machining and bore sizing complete the sprocket to specifications. Plate sprockets can be purchased separately. Various pitches and number of teeth may be combined with different hubs.


INSERT TYPE NOSE PIECE, CONE OR WEDGE OPTIONAL
CHECKING HEAD
DIAL INDICATOR FOR ECCENTRICITY CHECK
HANDLE FOR RETRACTING SPRING-LOADED CHECKING SPINDLE
HEADSTOCK WITH INSERT TYPE CENTER
BASE PLATE
RETRACTING TAILSTOCK WITH INSERT TYPE CENTER
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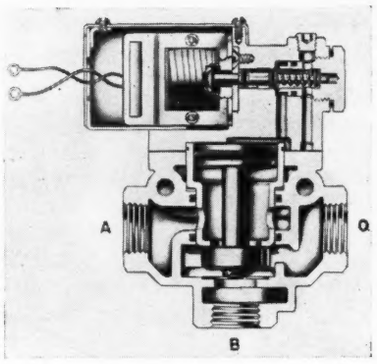

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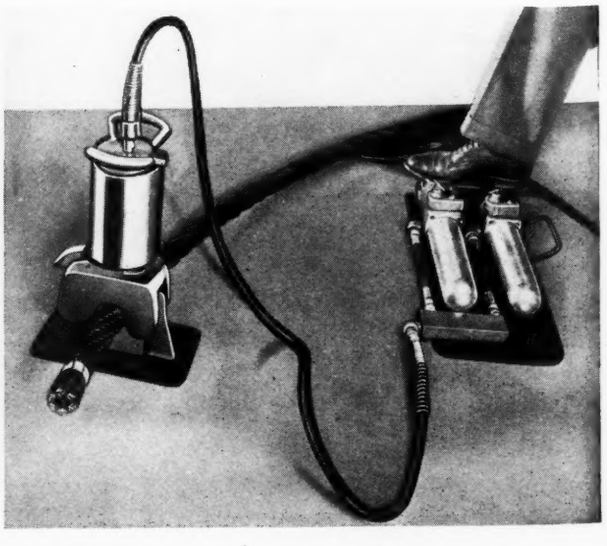

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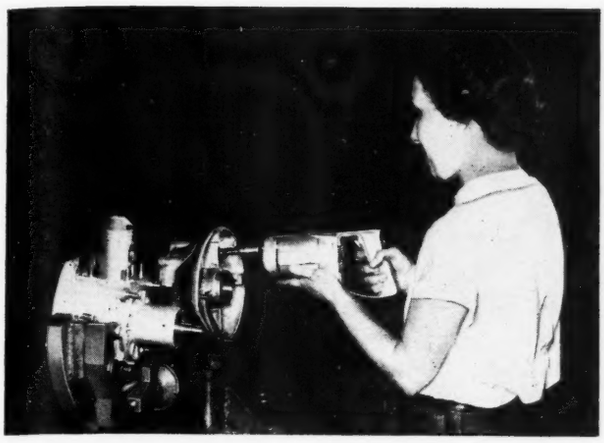

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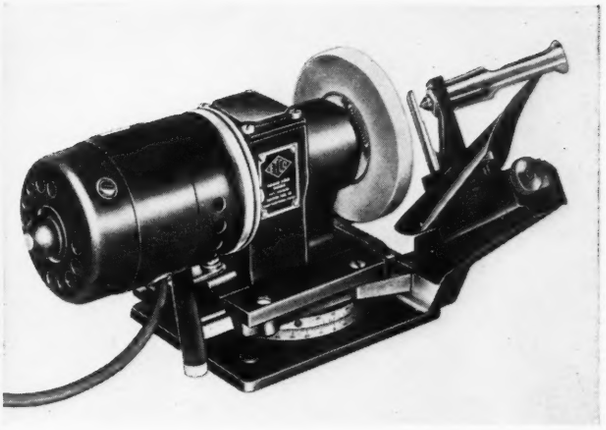

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The Eastern Tool Co., East Hartford, Conn., has just placed on the market a new diamond wheel dressing machine designed to prolong the life of any diamond wheel. This machine is easily mounted on a work-table for radii, periphery, and angular truing of wheels within extremely close limits of accuracy. Double- and single-row bearings are used to insure a true running wheel. A vernier scale is provided for quick, precise angle setting.

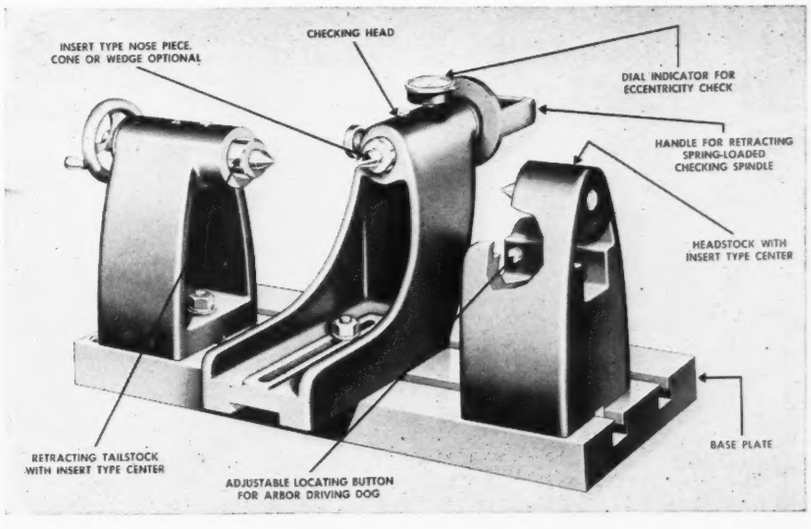
"Red Ring" Stock Divider for Gears

The National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., has brought out a stock divider to facilitate accurate setting up of gears preparatory to grinding. This device can be used to determine precisely the amount of eccentricity in the gear to be ground, as well as locate the high point on the pitch circle. Using the data thus obtained, the gear can be clamped on its arbor so that an equal amount of stock will be presented to the grinding wheel on each side of the high point.

The dividing operation can, of course, be performed on the gear grinding machine, but this practice has the disadvantage of causing idle machine time. The stock divider allows the machine operator to clamp a gear on the arbor while its predecessor is being ground. Thus the only idle time for the grinder is that required for unloading and reloading.

Cullman Time-Saving Sprockets

Technical ingenuity in the field of power transmission is demonstrated in a "semi-stock" sprocket just announced by the Cullman Wheel Co., Chicago 14, Ill. The sprockets in this new line are designed to convert sprockets previously made to order into "off-the-shelf" stock items. By welding one or two hubs to a Cullman semi-stock Type A sprocket, it can be converted into a Type B or Type C sprocket. Finish-machining and bore sizing complete the sprocket to specifications. Plate sprockets can be purchased separately. Various pitches and number of teeth may be combined with different hubs.


INSERT TYPE NOSE PIECE, CONE OR WEDGE OPTIONAL
CHECKING HEAD
DIAL INDICATOR FOR ECCENTRICITY CHECK
HANDLE FOR RETRACTING SPRING-LOADED CHECKING SPINDLE
HEADSTOCK WITH INSERT TYPE CENTER
BASE PLATE
RETRACTING TAILSTOCK WITH INSERT TYPE CENTER
ADJUSTABLE LOCATING BUTTON FOR ARBOR DRIVING DOG

"Red Ring" stock divider for gears, introduced on the market by the National Broach & Machine Co.

Shop work-bench with drawer and cabinet pedestal units made by Standard Pressed Steel Co.

Work-Benches with Standard Units Having Large Storage Space

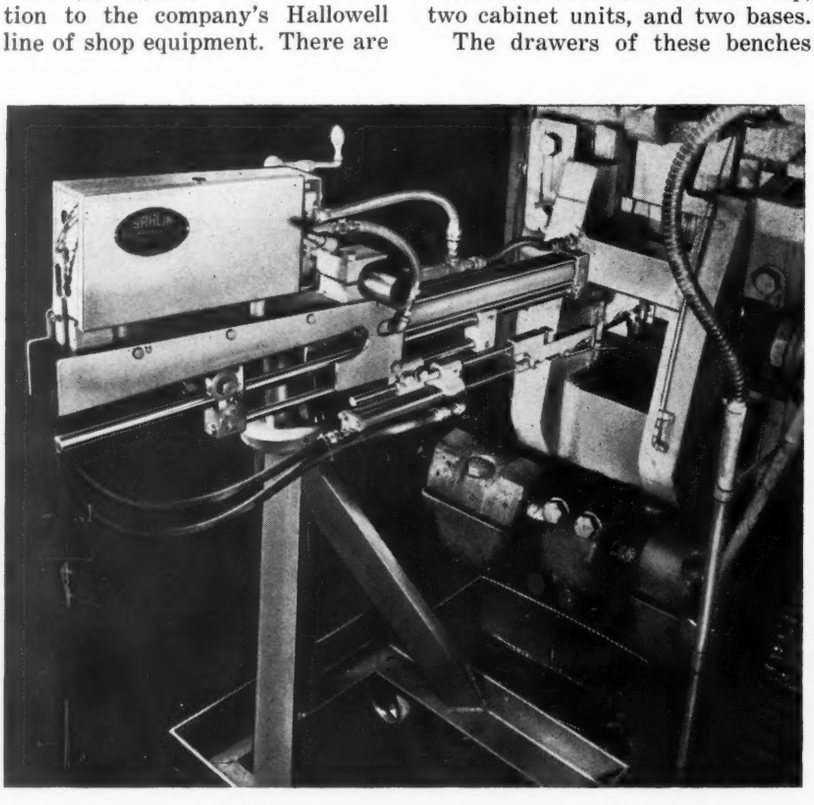
Work-benches with standard units which can be tailored to fit available spaces have been developed by the Standard Pressed Steel Co., Box 887, Jenkintown, Pa. These units, identified as the "640" series, are the latest addition to the company's Hallowell line of shop equipment. There are three basic models. Model 640 is made up of a top, two pedestals—one a drawer unit and the other a cabinet unit—and two bases. Model 643 includes a top, two drawer units, and two bases; and Model 646 is assembled with top, two cabinet units, and two bases.

The drawers of these benches move on rollers, and have individual cylinder locks and recessed drawer pulls. The cabinets have an adjustable shelf and chromium-plated locking handles. Tops are available in steel, "Presdwood" covered steel, or laminated wood. They come in 5- and 6-foot lengths and in nominal 24- and 30-inch widths. The tops can be placed end to end or joined with two tops resting on the same drawer or cabinet pedestal.

SKF Sealed Ball Bearings

Sealed ball bearings—designed to keep dirt out and lubricant in—that are interchangeable with conventional non-sealed bearings, have been announced by S K F Industries, Inc., Philadelphia 32, Pa. Known as S K F's "Red Seal" bearings, the seal is made of duPont Fairprene, and is not affected by petroleum-base lubricants, normal operating temperatures, or aging.

An exclusive design providing effective sealing—with extremely light contact and low friction—extends the seal below the steel retaining ring, forming a flexible lip which lightly touches a smooth, uniform chamfer of the inner ring. The retaining rings have circular-formed ribs to give them rigidity. The bearings are supplied in standard single-row S A E widths, and are available with any combination of snap-rings and metal shields.



Portable unloader for high-speed presses made by Sahlin Engineering Co.

Sahlin Portable Unloader for High-Speed Short-Stroke Presses

As companion equipment to its line of swinging-arm type automatic unloaders, the Sahlin Engineering Co., 267 Ferndale St., Birmingham, Mich., has introduced a portable unloader which can be used on small and medium-size presses for automatic removal of small parts. It consists of the same jaw, air cylinder, and electric control assemblies as used on Sahlin "Iron Hands," and can be set at any angle or adjusted up and down to suit various die levels. The jaw travels in a straight line, and removes small parts at

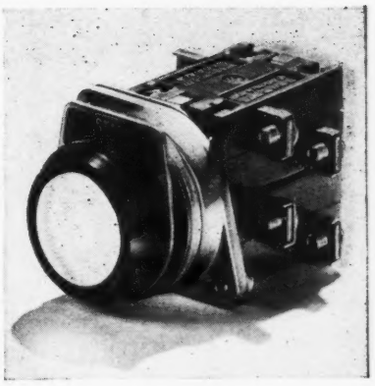
high speed. The unit is mounted on a heavy steel frame which has four caster type wheels with a built-in locking device.

When the ram of the press has completed the forming or shearing operation, and started on its upward stroke, the steel jaw of the unloader moves into the die and takes a firm hold on the stamping. The jaw lifts the stamping, withdraws it from the die, and drops it into a tote box or on a conveyor. The jaw then returns to its original position to await the next cycle.

General Electric Oil-Tight Push-Buttons

An oil-tight push-button unit for machine tool applications has recently been announced by the General Electric Co., Schenectady 5, N. Y. These units feature "self-a-line" contacts and removable color rings for push-button identification. The building-block construction provides increased flexibility of application because the basic units can be arranged in a variety of combinations to meet all special as well as standard requirements.

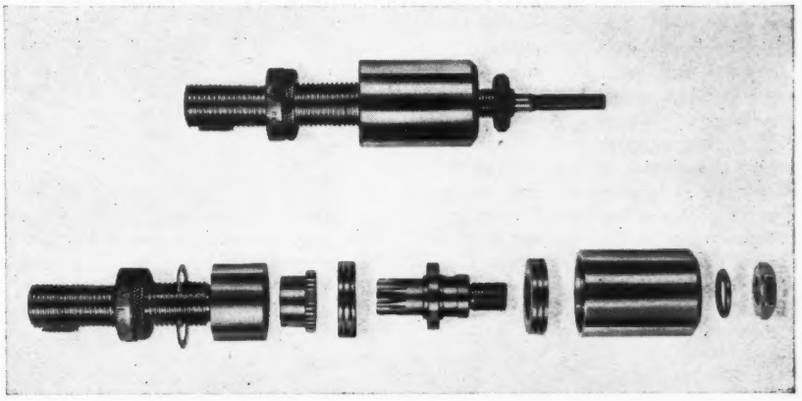
Coding of push-buttons with the new color rings, available in black, red, green, yellow, and white, is accomplished by screwing the color ring on the neutral-colored button. Operator types available include standard, extra long, and mushroom-head push-button; six forms of selector switches; two forms of combination units; padlock unit; and cylinder unit. Depth of the unit enclosure is 3 7/32 inches. A standard push-button extends 1/2 inch beyond the case. The strong, lightweight, aluminum enclosures are designed to meet all J.I.C. specifications.



Oil-tight push-button unit developed by the General Electric Co.

Floating Tap-Holder for Multiple-Spindle Machines

Floating tap-holder designated the "JT," announced by Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill., as a companion to its "JA" floating holder. This new tap-holder is intended for use in multiple-spindle machines. It has the same double-gear spline drive coupling for the neutralizing or intermediate driving member as the "JA" holder. Clearance between mating splines allows free movement at all times. Two thrust bearings, placed close together and separated from the drive, minimize the effect of the force applied on the tool and permit taps to float freely into alignment. Other features include small body diameter for close grouping and a short projection that requires less space between the spindle and the work. The collet is split on four sides and accurately centers the tap with a firm grip on the shank.



Hammond Automatic Polishing and Buffing Machine

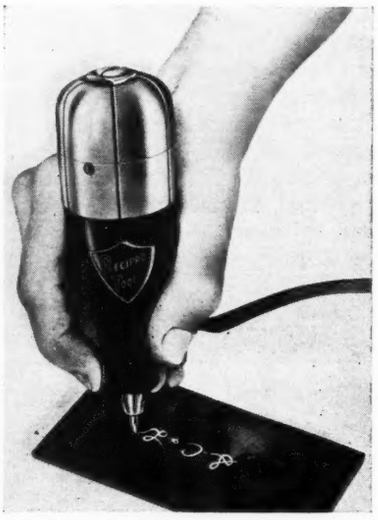
Continuous rotary automatic polishing and buffing machine with four 15-H.P. polishing and buffing heads. This machine was recently introduced on the market by Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich. Four different styles of automatic polishing, buffing, and deburring heads are now available for use on Hammond straight-line and rotary automatic polishing and buffing machines.

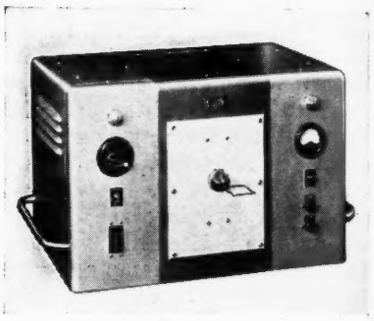
Electronic Trouble Spotter

Electronic trouble spotter developed to provide a quick low-cost means for accurately locating and analyzing the source of noises and vibrations in mechanical devices. This "Electro-Probe," as it is called, incorporates a sensitive vibration pick-up probe and a three-stage amplifier. It is a thousand times more perceptive than the human ear and is unaffected by airborne noises because it is sensitive only to vibrations at the point of contact. Speaker and headphones provide audible comparison of vibration sounds within a range of 60 decibels. A calibrated meter provides visual indication. Useful in locating leaks and stoppages in fluid piping systems, locating origins of structural vibrations, analyzing airborne sounds, and inspection of parts and subassemblies. Also permits checking critical points on running motors and machines to detect trouble before failure takes place. Placed on the market by Erwood, Inc., 1770 Berteau St., Chicago 13, Ill.

Heavy-Duty Reciprocating Hand Tool for Engraving

"Recipro-Tool" can be operated on any 110-volt, 60-cycle alternating current. It can be used to engrave letters, numbers, or identification marks on any material of any hardness, regardless of shape, size, or surface finish. In addition to marking, this tool can be used for riveting, filing, burring, and peening, as well as for cutting glass, gaskets, plastics, shim stock, and other materials. The tool operates at a speed of 7200 power strokes per minute. The strokes are adjustable from 0 to 1/8 inch. Product of S. C. & L. Machine Co., 1121 Fourth Ave., Rockford, Ill.



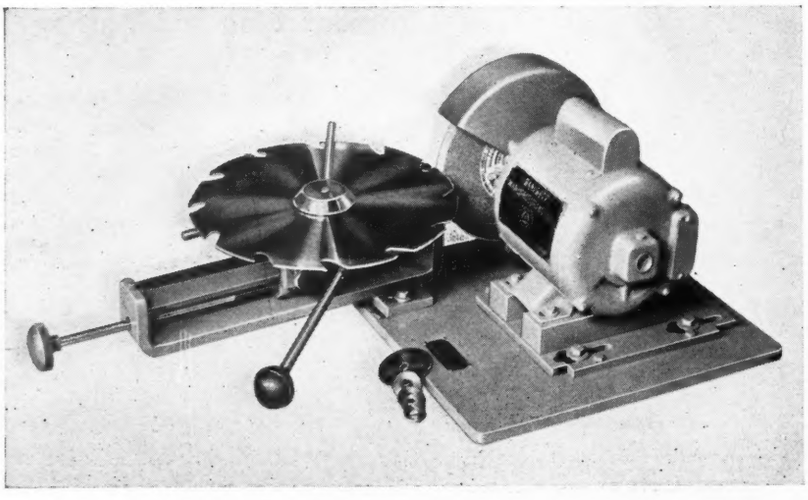


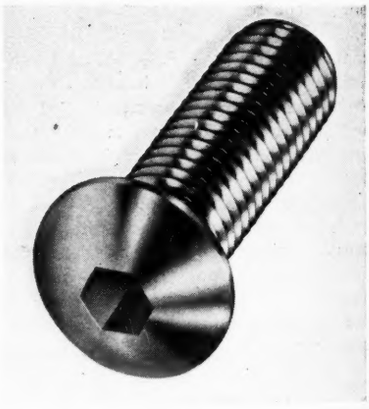
High-Frequency Heating Unit

New electronic high-frequency heating unit for soldering, brazing, hardening, annealing, and other controlled heat applications developed by the Lewis Machine Co., 892-4 Newcomb St., St. Paul 6, Minn. This unit, called the "Lewis 1500," is designed for use with either ferrous or non-ferrous metals in all metal-working fields. It is controlled by an automatic timer switch which may be pre-set for heating periods of from zero to sixty seconds. Coils and accessory equipment are available to meet a wide range of heating applications. Cabinet is 30 1/2 inches long, 19 inches high, and 18 inches wide.

Hanchett Circular Saw Sharpener

Cam-actuated "Easy Cut" circular saw sharpener introduced by the Hanchett Mfg. Co., Big Rapids, Mich. Designed to accurately generate the correct tooth shape with uniform, sharp, clean saw teeth. Will sharpen saws from 6 to 24 inches in diameter. The feed finger is spring-actuated. Adjustment for saw hook angle from 0 to 30 degrees is provided. Saw bushings in sizes from 1/4 inch to 2 inches in diameter are included. This sharpener can also be employed as a hand gummer. It is of compact and sturdy construction.

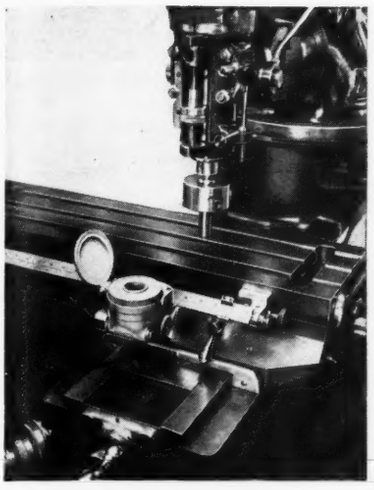




"Unbrako" Streamline Button-Head Socket Screw

Button-head hexagon-socket screw, designed for use where streamline appearance and high strength are wanted. This screw is the latest addition to the "Unbrako" line to be placed on the market by the Standard Pressed Steel Co., Box 887, Jenkintown, Pa. It has a low head and is made of heat-treated alloy steel. Available in seven thread diameters ranging from 0.164 to 5/8 inch. All except the two largest sizes, which are produced in the National Coarse series only, are available in both National Coarse and National Fine threads. The different diameters are made in four to seven lengths. Threads are precision rolled.

(This section continued on page 231)



"Scan-A-Scale" for Linear Positioning of Tables

"Scan-A-Scale," made by F. T. Griswold Mfg. Co., Wayne, Pa., to provide a precise and simple optical means for making accurate linear settings or measurements on machine tools. This device consists of two microscopes and two scales with 0.050-inch graduations. By rotating a dial on the microscope, the graduations on the scale can be divided so that readings to four decimal places are easily determined. Uses include control of table movements and boring head locations on jig borers and boring mills; positioning lathe carriages to secure accurate length setting; locating milling machine table in its three planes; and positioning cylindrical grinding machine tables in relation to side of wheel.

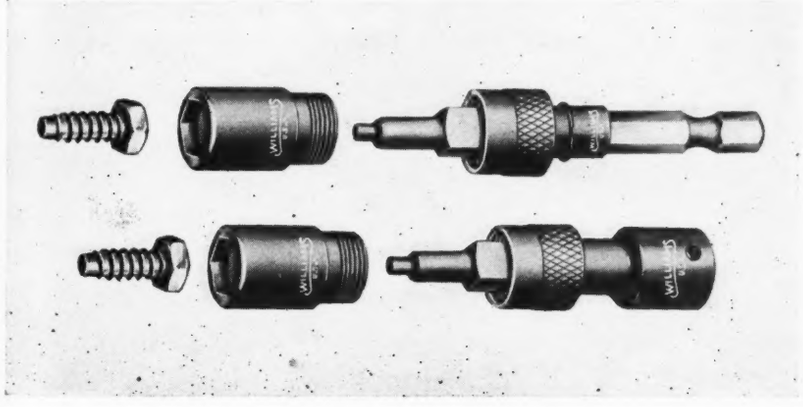
Snap-Action High-Precision Cam-Operated Micro Switch

Snap-action switch designed for high-precision performance in rugged, cam-actuated service announced by Micro Switch, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. This switch has the capacity to make or break steady currents of 20 amperes and to handle in-rush currents as high as 75 amperes. It has a roller plunger actuator adapted for operation by cams with a rise angle of up to 30 degrees. The plunger assembly can be turned to any position necessary to align its roller with the direction of cam approach.

Made in single-pole, double-throw types for 3/4-H.P. 115-volt alternating current, and 1 1/2-H.P. 230-volt alternating current.

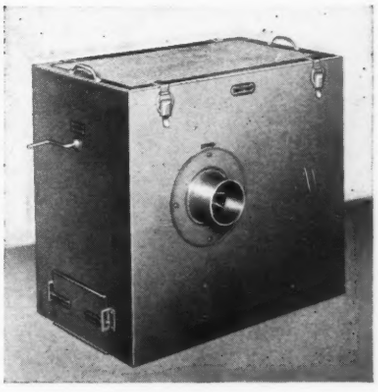
Williams Magnetic Driving Devices for Power Screwdrivers and Wrenches

Magnetic adapters and hexagon-square shanks (patents pending) developed for use with Williams impact "Supersockets" to drive hexagonal head hardened and self-tapping screws. Just announced by J. H. Williams & Co., 400 Vulcan St,. Buffalo 7, N. Y. A telescopic magnetic device within an assembled socket contacts the screw-head, retaining it within the socket opening. The left-hand threaded socket connection provides a positive fastening of the socket to the shank or adapter. A hexagon-square shank and an adapter are available for use in the operation of 1/4-inch drive tools which have socket opening sizes of 1/4, 9/32, 5/16, and 3/8 inch.



Three-Spindle Turret Head Attachment for Drill Press

Three-spindle turret head which can be attached to any drill press to permit sequence drilling, countersinking, and tapping on a single drill press spindle, recently introduced by the Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill. This "Select-A-Spindle" attachment provides each spindle with speeds adapted for drilling, reaming, counterboring, and tapping. The capacity on all three spindles is 3/8 inch. Adjustable torque control for the protection of taps up to 1/4 inch may be supplied for all of the spindles of the turret head.

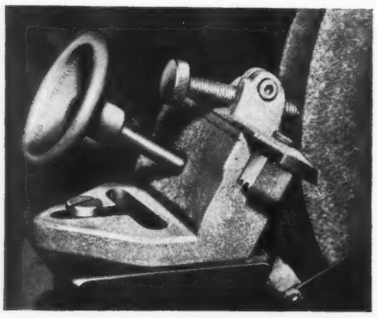


Small-Size Large-Capacity Dust Collector

New self-contained "Dustkop" dust collector especially designed for remotely located individual grinders, polishers, sanders, buffers, etc., recently added to its line of industrial dust collectors by the Aget-Detroit Co., 135 Main St., Ann Arbor, Mich. This unit requires a floor space of only 18 by 23 inches and is only 25 inches high, yet has a rated capacity of 525 cubic feet per minute at a static suction of 2 inches water lift. It is available with single- or double-inlet connections and has a self-clearing fan direct driven by a 1/3-H.P. continuous-duty motor.

"Red Flash" Wheel Dresser

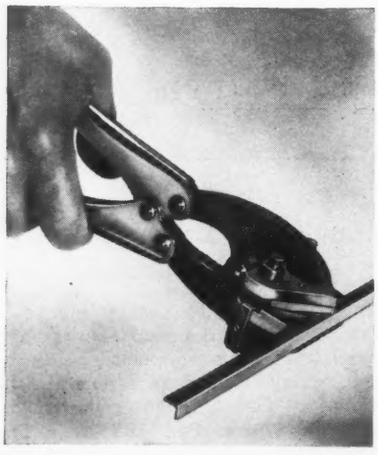
Wheel dresser designed for simple, rapid precision truing and facing of grinding wheels. With this "Red Flash" dresser, it is possible to obtain concentric, sharp, fast cutting grinding wheels having the wheel face flat and square to the axis or at any desired angle. The



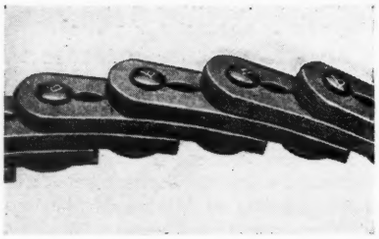
dresser is precision built to true wheels up to 2 1/4 inches wide. A 1/2-carat truing diamond will dress wheels up to 8 inches in diameter by 3/4 inch wide. The width handling capacity increases as the diameter decreases. Product of Monarch Machine Shop, Inc., Box 3026, Madison 4, Wis.

"Metalmitre" Hand-Operated Metal-Cutting Tool

"Metalmitre" hand tool which requires only a light squeeze of the polished stainless-steel handle for clean, accurate cutting of non-hardened steel up to 1/32 inch thick and of metals like copper and aluminum up to 1/16 inch thick. Various types of interchangeable hardened and precision

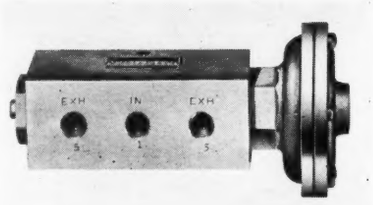


ground tool steel dies are available for burr-free mitering, notching, and slotting operations. The tool is especially adapted for use in sheet metal, molding, fiberboard, and plastic work. Introduced on the market by Lander & Abbott, La Crescenta, Calif.



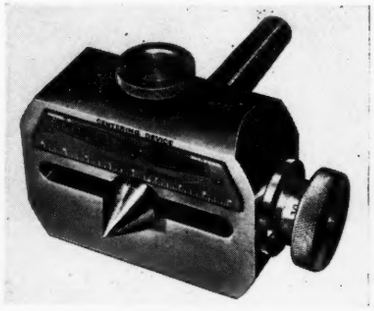
Brammer V-Link Belt

Detachable V-link belt that is prestretched, will not slip, and can be run in either direction. Unique features are said to prevent distortion after usage and permit smooth vibration-free service at top speeds in either direction. Made from tough woven cloth impregnated with top grade heat- and oil-resistant crude rubber. Product of the Brammer Co., 684 Broadway, New York 12, N. Y.



"Quick-As-Wink" Diaphragm-Operated Valve

Diaphragm-operated single-plunger valve made by C. B. Hunt & Son, Inc., Salem, Ohio. This "Quick-As-Wink" valve is designed for use in research laboratories, as well as in industrial and commercial plants where only low pressure air of from 12 to 35 pounds per square inch is available for actuating the diaphragm. Furnished tapped for either 1/8- or 1/4-inch pipe connection, in two-way, three-way, double two-way, four-way, and five-way designs for use with air, oil, or water at line pressures up to 125 pounds per square inch. Can also be used on vacuum lines at normal temperatures (not exceeding 150 degrees F.).

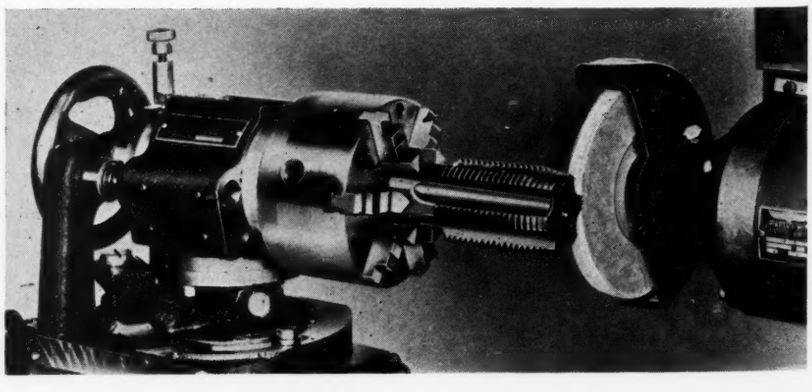


Centering and Taper Turning Attachment for Lathe Tailstock

Lathe tailstock centering device and taper turning attachment placed on the market by Master-Taper Co., 4531 N. Beacon St., Chicago 40, Ill. This attachment is manufactured in two sizes—one with a No. 2 Morse taper shank and the other with No. 3, 4, or 5 Morse taper shank—to cover a range of sizes applicable to lathes from bench to extra heavy-duty types. The attachment fits into the lathe tailstock, eliminating any special fitting or machining. The micro screw (with graduations) actuates the 60-degree center in either direction with a positive lock at any position desired. Can be used to turn tapers up to 3 inches per foot, employing the graduations indicated on the faceplate.

Six-Jaw Chuck for D-S Grinder

Six-jaw chuck made for the D-S radial relief grinding fixture, announced by the D-S Grinder Division, Royal Oak Tool & Machine Co., 619 E. Fourth Ave., Royal Oak, Mich. This chuck is designed to permit grinding tools that cannot be readily held in a collet, or for which no collet of the correct size is available. The chuck is a 4-inch model specially adapted for the D-S fixture to assure accurate alignment. A shank, precision ground for the D-S



This $\frac{3}{16}$" x 18' Cincinnati All-Steel Shear, one of the Cincinnati units at Convair, has the length to cut full length standard sized sheets.

Cincinnati All-Steel Shears at Consolidated Vultee Corporation are shearing sheets straight and true in the important production of the world's largest bombers.

Illustration shows a $\frac{3}{16}$" by 18' Cincinnati Shear, one of the Cincinnati units at Convair. Aircraft production requires unusual length as well as unusual accuracy in shearing. Cincinnati furnishes shears to the aircraft industry in lengths up to and including 24' of length in $\frac{1}{4}$" thickness.

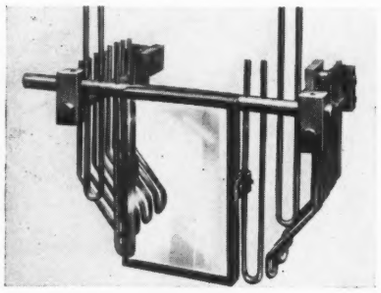
Cincinnati All-Steel Shears will give you accurate performance. Write for Shear Catalog S-6.

THE CINCINNATI SHAPER CO.
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

spindle, with integral adjustable backplate has been added to the chuck body. The adjustable feature is said to assure concentricity within 0.0005 inch total indicator run-out.

Punch Press Safety Guard

Adjustable die enclosure guard for punch presses, designed for improved visibility of work, just announced by



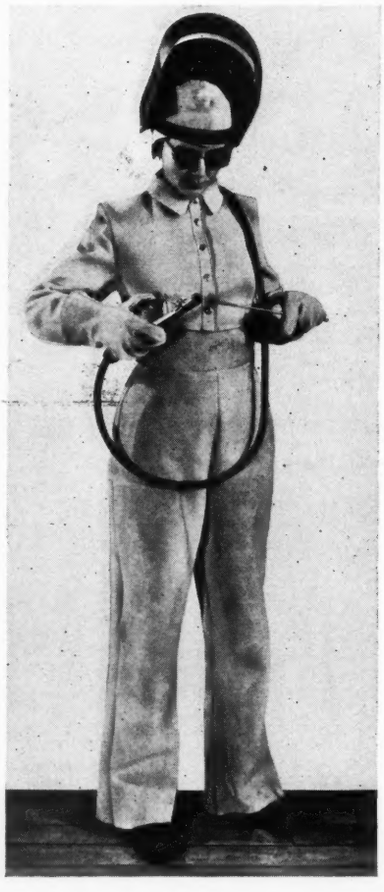
W. I. Martin & Co., 224 S. Michigan Ave., Chicago 4, Ill. A transparent center window of heavy-duty laminated safety glass offers crystal-clear vision of the entire die area plus complete protection for the operator from eye injuries due to flying particles. The hardness of the safety glass used for the window makes cleaning easy and simple without danger of scratching and fogging. A wide range of standard sizes is available to fit any size of press.

Instrument for Noise-Level Measurements

Pocket size "Sound-Survey Meter" designed for a wide range of applications in nearly all fields of sound measurement. Industrial uses of the instrument include the measurement of machinery noise, deafness-risk surveys, and noise studies on industrial equipment and household appliances. The total range of the meter is from 40 to 136 decibels. The instrument weighs only 1 pound 14 ounces, with batteries. Placed on the market by the General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.

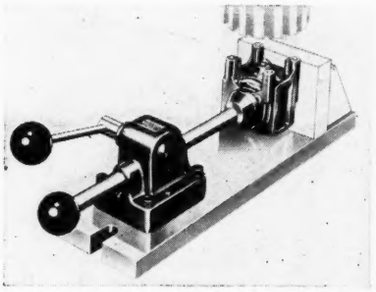
Lightweight "Twecotong" Electrode Holder

"Twecotong" lightweight 300-ampere electrode holder introduced by the Tweco Products Co., P. O. Box 666, Wichita 1, Kan. This holder features a lightweight, high-copper alloy for maximum conductivity. Raised upper lever allows plenty of room for the operator's hand with a welding rod in the jaws. Body and tip ends of the holder are provided with "Super-Mel" insulators. The tip-end insulators are interchangeable. Holder will handle electrodes from 1/16 to 7/32 inch diameter and is only 9 1/4 inches long. The welding cable may be soldered or clamped mechanically to the holder.



Protective Clothing for Feminine Workers

Protective clothing, light in weight, designed exclusively for industry's feminine workers, announced by American Optical Co, Southbridge, Mass. Styled to allow free and easy movement of the body, yet fitting so snugly that there are no gaps or openings to permit entrance of flying sparks. A side placket insures a trim, comfortable waistline, while the flared trouser legs provide additional protection for the feet and make the garment easy to put on and take off over safety shoes. The yoked back and shoulder tucks of the tailored coat and short jacket permit freedom of arm movement. Made of specially selected chrome tanned leather, simulating a soft, suede-like appearance.

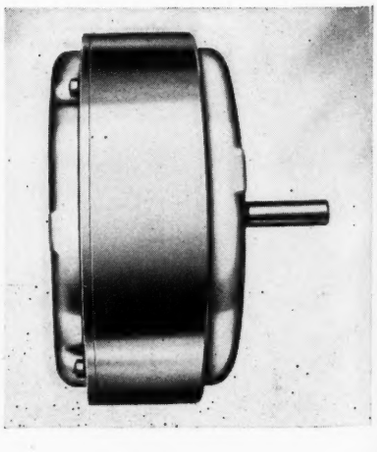


"Grip-Master" Fixture Lock

Quick-acting locking device for jigs and fixtures announced by the National Machine Tool Co., Racine, Wis. A simple push or pull on the bar knob sets the Heinrich "Grip-Master" lock at any position between open and closed. Light pressure on the locking lever gives an extra forceful forward motion to the bar, exerting a holding force up to 1500 pounds.

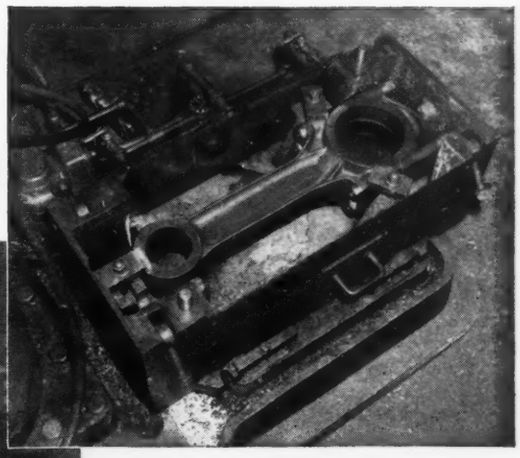
Reuland "Wafer" Motor

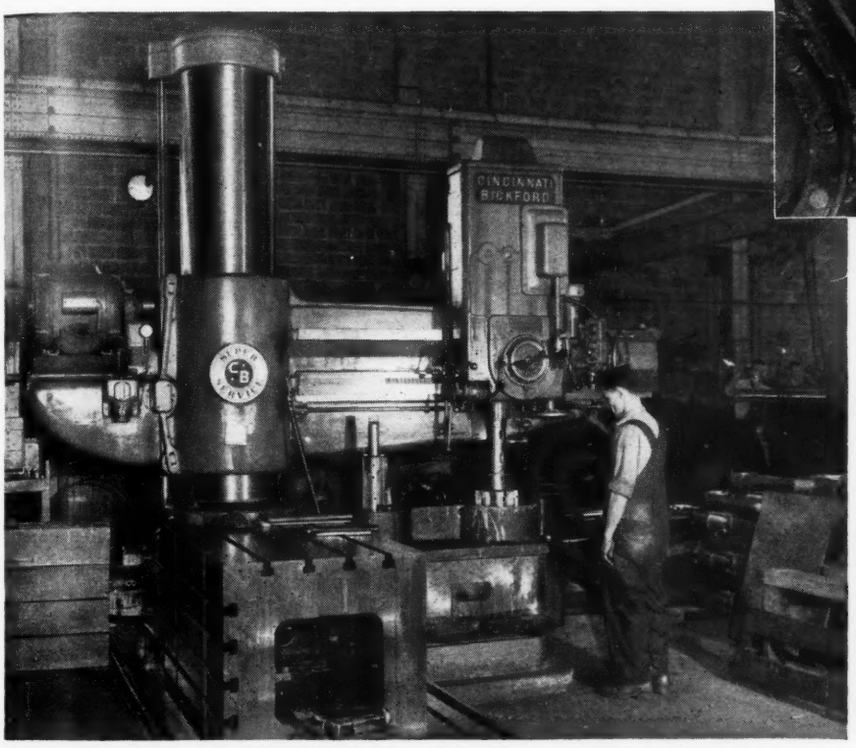
New "Wafer" motor having an exceptionally short over-all length designed for applications requiring a totally enclosed, air-cooled unit of flat design. It is available in ratings from 1/20 through 5 H.P. and in speeds from 450 to 3600 R.P.M. — single phase or polyphase. It can be mounted in any position, shaft up or down. This motor is available in a wide number of frame sizes from the Reuland Electric Co., Alhambra, Calif.



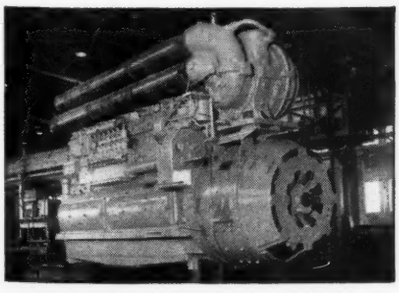
"by recommendation of the shop"

DOMINION ENGINEERING WORKS, LTD.





These rods are for Diesel electric locomotives. Large end of rods is 8⅞" diameter. Small end is 5½" diameter.



These Diesel Engines are used on Canadian railroads.

Connecting rods for 1000 horsepower Dominion Alco Diesel Engines are bored both ends with special multi-tooth boring heads.

The Dominion Engineering Works, Ltd., Montreal, states: "This and other Cincinnati Bickford machines were purchased on the recommendation of shop personnel which, we think, speaks for itself."

The high productiveness, ease of control, accuracy and stamina of Cincinnati Bickford Super Service Drills, and their versatility, make them outstanding performers.

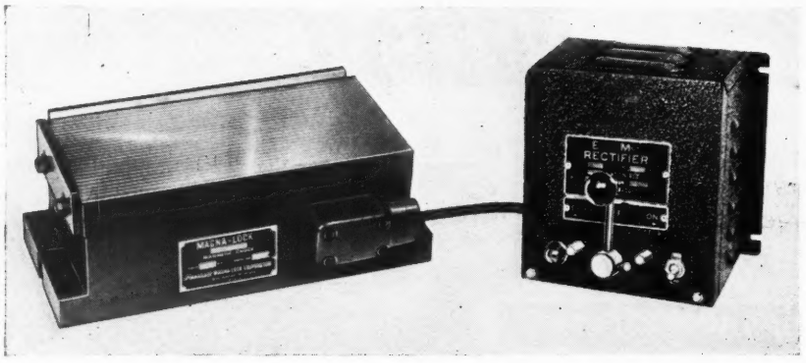
Write for Bulletin R-29.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

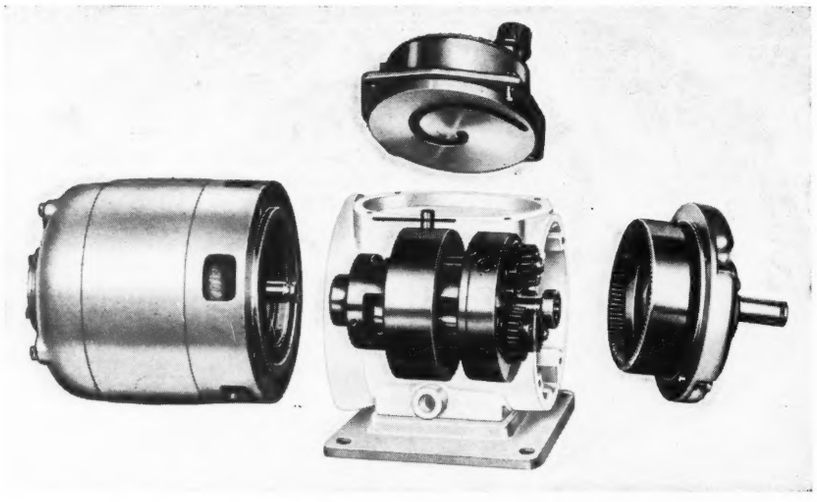
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.



Magnetic Chucks for Small Machine Tools and Bench Work

Small electromagnetic chuck designed to make magnetic chucking available for small machine tools and for bench work. These chucks are the latest addition to the line of magnetic chucks and devices manufactured by the Hanchett Magna - Lock Corporation, Department 210, Big Rapids, Mich. Chuck sizes are 5 by 10 inches, 6 by 12 inches, and 6 by 18 inches. The chucks are designed to facilitate holding workpieces for hand sawing, scraping, layout, filing, welding, drilling, grinding, and similar operations. They are moisture- and shock-proof. Standard accessories are available.



Graham Lighter-Powered Variable-Speed Transmission

Phantom view illustrating operating principle of the Model 18 unit recently added to the line of infinitely variable-speed transmissions made by Graham Transmissions, Inc., 3754 N. Holton St., Milwaukee 12, Wis. This unit is available with the various types of controls and reduction assemblies developed for the more powerful Model 20 unit. The graduated micrometer type control handle permits extremely fine adjustment of the output speed. The drive uses a compound planetary gear system with a non-rotating traction ring which engages two or more tapered rollers. Speed changing is accomplished by sliding the traction ring axially over the rollers. The rollers are supported in a carrier and are inclined at an angle so that their outer surfaces are maintained parallel to the central axis. The required traction pressure between rollers and ring is obtained through the centrifugal force of the rollers themselves, which press outwardly against the ring under the action of centrifugal force.

Barrett "Air-Power" Riveter

Lightweight "Air-Power" riveter designed for high-speed operation announced by the Barrett Equipment Co., 21st and Cass, St. Louis 6, Mo. This riveter can be used for riveting, removing rivets, punching, forming, and stamping merely by changing tools. A foot control is furnished, but either a hand or automatic control can be used. The riveter is only 16 inches high, weighs but 37 pounds, and is designed with a throat clearance of 3 1/2 inches. An air-line pressure of 100 pounds per square inch produces a working pressure of 1100 pounds with an 11/16-inch stroke.

* * *

New Lubricant Developed for Dead Centers and Steadyrests

A new lubricant has been developed for dead centers which provides a bonded lubricating film on bearing surfaces and imparts the low friction and anti-seizing properties necessary to resist extreme bearing pressures and temperatures. This lubricant, called "Molykote - Centerlube," is a product of the Alpha Corporation, Greenwich, Conn. The basic ingredient of the new product is a lubricating grade of molybdenum disulphide powder known as "Molykote, Type Z."

Although developed for dead center lubrication where loads and speeds are beyond the capacity and temperature ranges ordinarily used, the new lubricant has also been highly successful for steadyrest lubrication and for reducing wear on plug and thread gages. It is also an excellent lubricant for press fitting, heavily loaded gears, ways and gibs of machine tools, and for hundreds of other difficult lubrication jobs.

* * *

The federal personal income tax was adopted in 1913, with rates ranging from 1 to 7 per cent. Today rates range from 22.2 to 92 per cent. The corporation tax, when adopted in 1909, amounted to 1 per cent. Today it averages 60 per cent of corporations earnings. The total tax burden—federal, state, and local (direct and hidden)—now approaches 35 per cent for the average American.

Between Grinds

By E. S. Salichs

Laboratory Sport

Electronic experts now utilize a principle termed "electron trapping" to operate radios and television sets at high frequencies. A few electrons are trapped in a tube and moved at high velocity. They collide with each other (any subway rider can demonstrate this feature). Many more electrons are thus created, the supply being sufficient for the operation of the tube as a rectifier, generating up to 15,000 DC volts.

Team, Team, Yareem!

An article describing form-grinding practice at the Yarema Bros. Tool & Die Co. (December MACHINERY) caused Alexander Yarema to write to our Editor somewhat later as follows: "I am happy to inform you that due to the splendid manner in which you have presented this article, we have received enough inquiries from this country and from abroad to encourage us to manufacture these dressing attachments."

No Chore Delivering the Ore

The Atomic Energy Commission has set up a graduated bonus arrangement to reward mining operators in proportion to the amount of uranium oxide content in acceptable uranium ore, in addition to established prices paid for the ore.

Walkie-Talkie HANDBOOK

Unique request reached our book editor from a California radio "ham." He wanted just the cover of MACHINERY'S HANDBOOK so that he could install a small radio that he had built within the binding in place of the text customarily found within the covers of our book. The cover was sent to him. Now, instead of referring to tempering, stresses and strains, friction, melting points, etc., in the book, he tunes in and gets weather reports, current events, domestic stories, etc. Not to mention the messages from Mars that "hams" probably intercept. Page 339 of the HANDBOOK, Critical Speed of Rotating Body?

Hands of Time

Like the old-time cook who never measured ingredients, one of our contributors described a shop operation as "taking a handful of minutes."

Duly Noted

Without fishing for compliments, the Ocean City Mfg. Co., Philadelphia, Pa., has a Reel Service Department.

A MAN AND HIS PRESS— O. A. (Bud) Wheelon, production design engineer at the Douglas Aircraft Co., Santa Monica, Calif., at the control pedestal of the new type of hydraulic press which he developed — described in an article beginning on page 176 of this number. Mr. Wheelon was born in Pierre, S. D., and was graduated from the State University of Iowa in 1931. Twelve years later he joined Douglas, obtaining practical design experience in the landing gear and hydraulic groups. Mr. Wheelon's career has evolved into a series of major projects, such as the study of design and manufacturing techniques for 75S aluminum alloy, and of processes for manufacturing integral wing fuel tanks. At the spring meeting of the S A E he was awarded the Wright Brothers Medal for his published analysis of problems involved in using titanium in airplane design and construction. Mr. Wheelon has an invigorating hobby — ocean swimming daily before breakfast—and in this instance we really believe the "daily," because picture-wise the proof is demonstrated in Bud's wide shoulders and California suntanned countenance.

News OF THE INDUSTRY

California and Texas

F. W. Stewart Mfg. Corporation, Chicago, Ill., announces the opening of a new plant at 1638 S. Flower St., Los Angeles, Calif., which will be devoted to the manufacture and fabrication of flexible shaft assemblies, flexible shafting, and their components. The Los Angeles plant was formerly located at 431 Venice Blvd.

Rivett Lathe & Grinder, Inc., Boston, Mass., has appointed the Paul-Munroe Co., 4867 E. Gage Ave., Bell, Calif., representative for the Rivett line of air and hydraulic valves and cylinders, and hydraulic power units.

Wear Associates, Dallas, Tex., have been made representatives for the Colonial Broach Co., Detroit, Mich., manufacturer of broaching machines and equipment, and Colonial Bushings, Inc., Fraser, Mich., producers of drill jig bushings.

Illinois and Indiana

N. J. Kassnel, chief engineer of the Verson Allsteel Press Co., Chicago, Ill., manufacturer of stamping presses and tooling, was recently appointed to the position of vice-president in charge of engineering. Paul Kjelstrom, who was design engineer and chief draftsman for the company, has been made chief engineer. Also announced were the appointments of Christ Zeilenga, chief engineer for research and development, and Henry DeMatteo, assistant works manager.

Sundstrand Machine Tool Co., Rockford, Ill., has formed a subsidiary, Sundstrand International Corporation, to conduct the export business of the various divisions of the company. Officers of the subsidiary are: President, Bruce F. Olson, president of the parent company; vice-president, Richard H. Olson, former director of export sales; and sales manager, Paul Bert. Home offices of the new organization will be in Rockford.

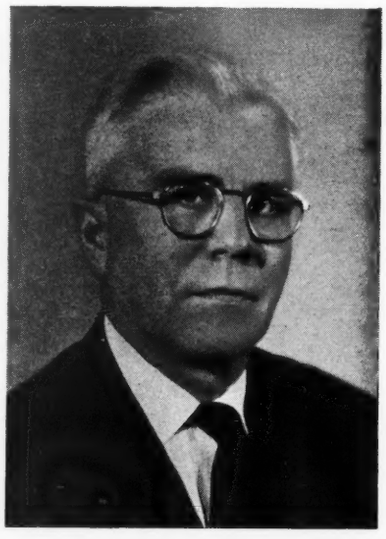
Walter M. Hanneman has been appointed executive engineer of Shakeproof, Inc., Division of Illinois Tool Works, Chicago, Ill. Mr. Hanneman, who has been with the Illinois Tool Works for more than twenty years, will be located at Shakeproof's St. Charles Road plant in Elgin, Ill. Also announced was the appointment of William B. Denniston as manager of distributor sales, his headquarters also being at Elgin.

Richard Smith has been made president of Jet Combustion, Inc., Chicago, Ill., succeeding the late John E. Tegarden, founder of the company. Mrs. John Tegarden has been named executive vice-president; Richard Kelly, vice-president in charge of engineering; and Steve Kupres, vice-president in charge of field operations.

Olin Industries, Inc., East Alton, Ill., has acquired Ramset Fasteners, Inc., Cleveland, Ohio, manufacturer of power-actuated industrial tools. The Ramset organization will continue under its present management and be operated as part of the Arms and Ammunition Division of Olin Industries, Inc.

Charles F. Keyser has been made central district sales manager of Shakeproof, Inc., Chicago, Ill., a division of Illinois Tool Works. Mr. Keyser's office will be located in the company's plant at 2501 N. Keeler Ave., Chicago.

L. B. Perkins has been elected vice-president and general manager of the D. A. Stuart Oil Co., Ltd., Chicago, Ill., manufacturer of cutting fluids and special lubricants.



L. B. Perkins, vice-president and general manager of the D. A. Stuart Oil Co., Ltd.

Gilmore J. Landstrom, vice-president of the Sundstrand Machine Tool Co., Rockford, Ill., has been elected treasurer of the company, while continuing as vice-president. Burnell A. Gustafson, manager of the Machine Tool Division, has been elected vice-president of that Division.

Sales Service Machine Tool Co., St. Paul, Minn., has appointed Neff Kohlbusch & Bissell, Inc., 5700 W. North St., Chicago, Ill., exclusive distributors for the Press-Rite line of open-back inclinable presses.

Robert Oehler has become sales engineering manager of the Chicago district for Anker-Holth, Division of the Wellman Engineering Co., Port Huron, Mich. He will be located at 520 N. Michigan Ave., Chicago, Ill.

Jack P. Williams, 20 N. Wacker Drive, Chicago, Ill., has been appointed midwestern representative for the Centric Clutch Co., Woodbridge, N. J., manufacturer of Rawson clutch couplings.

Shakeproof, Inc., Division of Illinois Tool Works, Chicago, Ill., has formed a special stampings department, with Carl F. Jensen as manager.

H. S. Hoyt, Jr., has become manager of the Chicago, Ill., branch of A. Milne & Co., New York City, distributor of solid and hollow tool steels.

Illinois Gear & Machine Co. has purchased approximately 200,000 square feet of land adjacent to the main office and works in Chicago, Ill.

Fred J. Ebeling has been appointed to the newly created post of general sales manager of the Dodge Mfg. Corporation, Mishawaka, Ind.

Louisiana and Alabama

Michigan Tool Co., Detroit, Mich., has appointed the Oliver H. Van Horn Co., Inc., 1742 St. Charles Ave., New Orleans 1, La., representative in the states of Louisiana and Mississippi for the company's line of gear production and checking equipment, and gear cutting tools.

Will Cain has been made New Orleans sales representative for the A. O. Smith Corporation, Milwaukee,

Lowest Cost Way TO DE-BURIZE up to 300 Gear Teeth per minute

MODEL NO. 380-A

Cut finished gear costs and raise output at the same time—with Sheffield #380 Series Gear Deburizers which offer the following advantages.

★ Burr or chamfer spur, helical, hypoid, bevel and herringbone gears, also, multiple start worms, up to 7″ O.D. (Model #381 will handle gears from 6″ to 12″ O.D.)

★ Operate on automatic or continuous cycle generally without clamping the work gear.

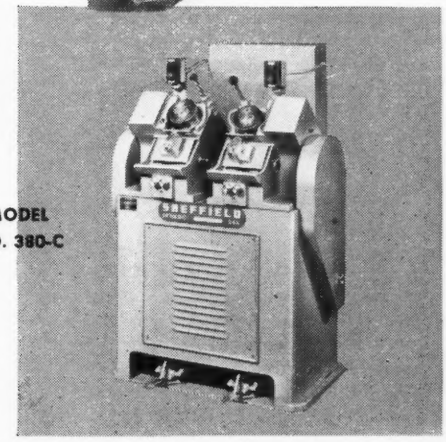
★ Use simple, low cost standard tool bits which are easily sharpened on the face angle only.

★ Interchangeability of tooling with minimum down time.

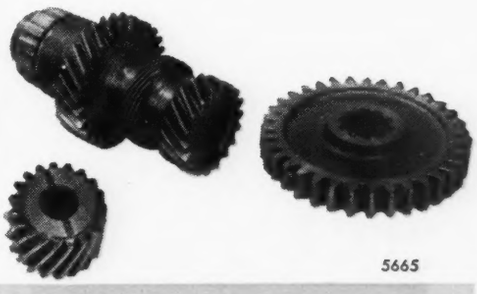
★ Small, compact, low cost machine requires minimum of setup and changeover time—and practically no maintenance.

★ Direct drive assures positive indexing.

Write for specifications #B-380-50 —or call your Sheffield Representative.



MODEL NO. 380-C



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SHEFFIELD

the Sheffield corporation

Dayton 1, Ohio, U. S. A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

Wis., steel fabricator and process equipment manufacturer. Mr. Cain's office is located at 538 International Trade Mart, New Orleans, La.

CINCINNATI CLEANING & FINISHING MACHINERY CO., Ironton, Ohio, has appointed C. E. HOLMES, 831 N. 20th St., Birmingham, Ala., to represent the company in the southern states.

Michigan and Wisconsin

CARBOLOY DEPARTMENT OF GENERAL ELECTRIC CO., Detroit, Mich., has begun construction of a permanent magnet manufacturing plant in Edmore, Mich. The plant, occupying an area of 90,000 square feet will cost, with equipment, over $3,500,000 and will be completed in the spring of 1953. It will be located adjacent to the Carboloy Department's new standard carbide tool fabricating plant, recently completed.

BOYER-CAMPBELL CO., Detroit, Mich., announces the election of the following officers: WILLIAM P. GOUDIE, president and chairman of the board; JOHN F. PHILLIPS, executive vice-president in charge of sales; and ROBERT G. CAMPBELL, vice-president, secretary, and general manager.

COLONIAL BROACH CO., Detroit, Mich., has appointed an Argentinian representative for its line of broaching machines and equipment in South America; C. E. THOMAS, Casilla 549, Buenos Aires, Argentina.

ROBERT SHANNON has been named manager of the Hastings, Mich., Division of the E. W. Bliss Co., Canton, Ohio, manufacturer of mechanical and hydraulic presses, rolling mills, and special machinery. Mr. Shannon has been with the Division for many years, most recently as assistant plant manager.

Robert Shannon, newly promoted manager of the Hastings, Mich., Division of the E. W. Bliss Co.

FRANK J. STAROBA has been named field sales manager for the Carboloy Department of General Electric Co., Detroit, Mich. Mr. Staroba, whose headquarters will be in Detroit, was formerly mid-western district manager, at Chicago, Ill. L. L. DECOSTER, sales engineer in the Indianapolis and Chicago areas, has been promoted to Mr. Staroba's former post.

RICHARD COUCH, JR., has joined A. Harold Frauenthal, Inc., Muskegon, Mich., manufacturer of grinders and turning and boring machines, in the capacity of sales manager.

NEUHOLD TOOL & MACHINE CO. has moved its office to 20913 Schoenherr Road, East Detroit, Mich., as a result of disposing of a company plant located at 27240 Bohn, Roseville, Mich.

ANTHONY J. ALLEN recently joined the Wall Colmonoy Corporation, Detroit, Mich., in the capacity of eastern sales manager with headquarters in New York City.

ROBERT LOOKER has become sales manager of the Huck Mfg. Co., Detroit, Mich., manufacturer of rivets, lock-bolts, and fasteners.

W. E. VOGEL, chief engineer of the Beaver Tool & Engineering Corporation, Royal Oak, Mich., has become sales manager of the company.

FAMCO MACHINE CO., Racine, Wis., announces the purchase of a plant at Kenosha, Wis., which will replace the two plants they now occupy. The new buildings will add approximately 40,000 square feet of floor space to the company's manufacturing facilities.

CHAIN BELT CO. announces the removal of its executive headquarters from 1600 W. Bruce St., to 4701 W. Greenfield Ave., Milwaukee, Wis.

New England

CRO-PLATE CO., INC., has expanded its manufacturing division at 747 Windsor St., Hartford, Conn., to include the entire area of approximately 10,000 square feet. The contract plating division, which formerly shared this plant, has been transferred to the company's East Hartford plant.

JOHN B. STEVENS, INC. has changed the company name to JOHN B. STEVENS CO. Also announced was the removal from 480 Canal St., New York City, to Somersville, Conn. The company manufactures machine tool accessories known as the "Stevens" line.

MILFORD RIVET & MACHINE CO., Milford, Conn., has appointed three new field representatives: HOWLAND HAYES, 972 Broad St., Newark, N. J.; ROBERT D. RICHTER, 40 E. 40th St., New York City; and W. T. PETERSON, 19650 Harper Ave., Detroit, Mich.

CLIFFORD C. MCALEENAN was recently appointed vice-president in charge of sales for the Capewell Mfg. Co., Hartford, Conn., manufacturer of pipe fitters' tools, band saws, hacksaws, and specialty nails.

HARRY W. HULTGREN, sales manager of the Cushman Chuck Co., Hartford, Conn., is retiring from his position. He is, however, continuing in the capacity of sales consultant for the company.

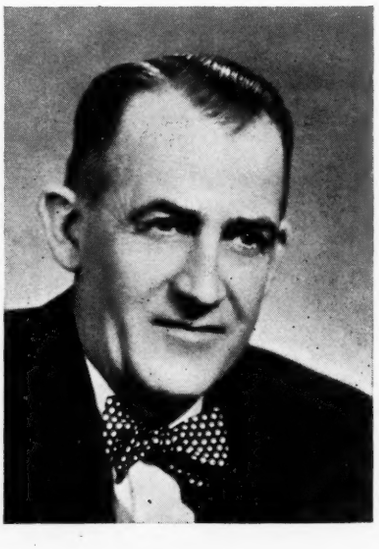
E. W. BLISS CO., Canton, Ohio, announces the transfer of its New Haven, Conn., district sales office from 129 Church St., to 7 Whitney Ave., New Haven 10.

CLARENCE J. DORR has joined the Sterling Engineering Co., Laconia, N. H., subsidiary of the American Machine & Foundry Co., in the capacity of sales manager.

FRANK A. BREDE has joined the Graton & Knight Co., Worcester, Mass., in the capacity of chief engineer in the research and development department.

STUART L. HARROD has been appointed manager of the Machinery Division of the Austin-Hastings Co., Inc., Cambridge, Mass.

JOHN J. HAYES, JR., was recently elected vice-president and general manager of the Morse Twist Drill & Machine Co., New Bedford, Mass. ANTHONY J. SNYDER was named assistant to the president.



John J. Hayes, Jr., vice-president and general manager of the Morse Twist Drill & Machine Co.

Photo Fabian Bachrach

Paul C. Nicholson, Jr., president and general manager of the Nicholson File Co.

PAUL C. NICHOLSON, JR., great-grandson of the founder of the Nicholson File Co., Providence, R. I., was recently elected president and general manager of the company. Mr. Nicholson replaces his father, Paul C. Nicholson, who was elected chairman of the board. The new president was elected to the positions of assistant secretary in 1942, director in 1947, and secretary in 1948, the office which he had held until the present time. The new chairman of the board had been president and general manager for the last thirteen years.

New Jersey and Maryland

WORTHINGTON CORPORATION, Harrison, N. J., announces that the Dunellen Works will be known in the future as the Plainfield Works. The plant is not actually in the town of Dunellen; the proper address is Plainfield, N. J.

LOUIS A. KNOLKE has been appointed sales representative for the Harrison Abrasive Division of the Metals Disintegrating Co., Inc., Elizabeth, N. J.

SAMUEL ZOLIN has become vice-president and treasurer of the Cooper Alloy Foundry Co., Hillside, N. J.

CLAUDE BATUK AND JOHN BESEMER have joined KSM Products, Inc., Merchantville, N. J., in the capacities of sales engineers.

BLACK & DECKER MFG. CO., Towson, Md., recently created the positions of five district managers for the United States and one for Canada. The following men, associated with the company in sales capacities, have been appointed to fill these positions: E. M. STUART, northeastern region; A. LEE PROCTOR, southeastern region; RAYMOND G. HORNER, central region; WILLIAM L. POYNTER, midwestern region; ARTHUR C. BOEHM, Pacific Coast; and DONALD S. MCKERACHER, Canada.

STERLING ELECTRIC MOTORS, INC., Los Angeles, Calif., has opened a sales office in Baltimore, Md., with E. STEPHEN FARLOW in charge. The office is located at 1658 Roundhill Road.

New York

MORSE G. DIAL has been elected president of the Union Carbide and Carbon Corporation, New York City, succeeding FRED H. HAGGERSON, who will continue as chairman of the board. Mr. Dial has been with the corporation since 1929 in various executive capacities, and last year was made executive vice-president. Also announced was the election of WALTER E. REMMERS as vice-president of the Alloys Division.

KURT ORBAN CO., INC., New York City, has been appointed distributor for the following German-built machines—Alfing drill presses, Nube milling machines, Jerwag climb millers, Bammesberger surface grinders, Biernatzki millers, and Sinn tool and diemakers' milling machines — and the Italian-built Ferrari grinders.

THOMAS D. CARTLEDGE, senior vice-president of Linde Air Products Co., a Division of Union Carbide and Carbon Corporation, New York City, has been appointed president of the company. HOWARD S. BUNN, vice-president of the Bakelite Co. and Carbide and Carbon Chemicals Co., both Divisions of Union Carbide and Carbon Corporation, has been made president of the Bakelite Co., New York City. Both men have been with the Carbide organization since the early 1920's.

DR. GEORGE V. SLOTTMAN has been elected vice-president of the Air Reduction Co., Inc., New York City. Dr. Slottman has been director of research and engineering for the company since 1949, and will continue in charge of that activity.

SCOTT H. PATTERSON was recently made branch manager of the Buffalo, N. Y., plant of the American Brass Co., New York City. Prior to his promotion, Mr. Patterson was district sales manager in the New York City office.

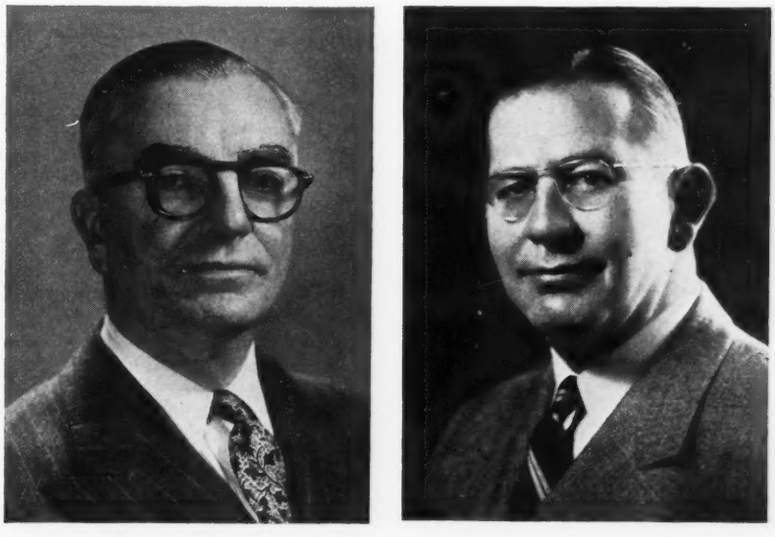
LAWRENCE J. WIMMER, who has been associated with the E. W. Bliss Co., Canton, Ohio, for thirty-five years, has been appointed eastern service manager. He will be located at the company's office in New York City, at 50 Church St.

TAFT-PEIRCE MFG. CO., Woonsocket, R. I., announces the appointment of G. W. BRUNTON & SON, INC., Buffalo, N. Y., as representative for its line of gages and tool-room equipment in central and western New York State.

PETER A. FRASSE & CO., INC., New York City, now distribute Acipco centrifugal cast tubing manufactured by the Special Products Division of the American Cast Iron Pipe Co.

DR. PAUL D. MERICA, executive vice-president of the International Nickel Co., Inc., New York City, was recently elected president of the International Nickel Co. of Canada, Ltd.

ARTHUR P. DAVIS has returned to Arma Corporation, Brooklyn, N. Y.,



(Left) Thomas D. Cartledge, president of Linde Air Products Co. (Right) Howard S. Bunn, president of Bakelite Co. Both companies are Divisions of Union Carbide and Carbon Corporation.

in the capacity of president. Mr. Davis had retired in 1947 from that position.

DoALL EASTERN CO., INC., New York City, was recently appointed sales-service representative for the complete line of Kalamazoo horizontal band sawing equipment.

K. J. WISE has become associated with the George Keller Machinery Co., Buffalo, N. Y. Mr. Wise was formerly resident factory sales engineer for the Gardner Machine Co.

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford, Conn., has moved the Rochester branch office to 845 Main St. W., Rochester 11, N. Y.

(Left) Foster H. Pettay and (Right) Chester H. Kimmel, newly elected vice-presidents of the Ohio Crankshaft Co.

Ohio

SUB-ZERO PRODUCTS, Cincinnati, Ohio, has appointed the following representatives: GEORGE KELLER MACHINERY CO., 1807 Elmwood Ave., Buffalo, N. Y.; DIXIE MILL SUPPLY CO., Tchoupitoulas and St. Joseph St., New Orleans, La.; and CLEVELAND DUPLEX MACHINERY CO., INC., Penton Bldg., Cleveland, Ohio.

RICHARD S. HUXTABLE has been elected a director of the National Tool Co., Cleveland, Ohio, replacing FRED V. GARDNER who has resigned. Mr. Huxtable is executive vice-president and general manager of the Fawick Airflex Co., Inc., also of Cleveland.

W. A. MANGOLD has been appointed general sales manager of the U. S. Drill Head Co., Cincinnati, Ohio. Mr. Mangold has been with the company for more than ten years in the capacity of sales and service engineer.

W. A. Mangold, who has been made general sales manager of the U. S. Drill Head Co.

FOSTER H. PETTAY and CHESTER H. KIMMEL were recently elected vice-presidents of the Ohio Crankshaft Co., Cleveland, Ohio. Mr. Pettay joined the company in 1941 as assistant secretary, and last year was elected to the board of directors. Mr. Kimmel, who has been with the company since 1940, is general manager of the Crankshaft and Camshaft Division, the position he has held since 1946.

HERM BOLEY has joined the Denison Engineering Co., Columbus, Ohio, in the capacity of assistant to the president. For more than twenty years Mr. Boley was general manager of Johns-Manville Boley Ltd., located in Buenos Aires. He then joined the E.C.A., and most recently was connected with the United States Embassy at London in directive work on iron and steel negotiations.

R. H. KITZMAN, vice-president and manager of the Toledo plants of the Doehler-Jarvis Corporation, Toledo, Ohio, has been appointed general production manager. Mr. Kitzman has been with the company since 1919. CLINTON ANDERSON has been promoted to the position of works manager.

JERGENS TOOL SPECIALTY CO., Cleveland, Ohio, has been appointed distributor for the ALLEN MFG. CO., Hartford, Conn., for the Allen line of hex-socket screws, pipe plugs, dowel pins, etc.

JERPBAK-BAYLESS CO., Solon, Ohio, has appointed the CROWN TOOL & SUPPLY CO., Chagrin Falls, Ohio, distributor for its line of profiled gear grinding wheels for the Reishauer gear grinder.

WELLMAN BRONZE & ALUMINUM CO., Cleveland, Ohio, announces the following appointments: JAMES M. ROBERTSON, chief chemist in charge of quality control; ROBERT C. BOEHM, chief metallurgist; and ROBERT W. SPACEK, assistant production manager.

WESTCOTT CHUCK CO., Oneida, N. Y., has appointed WILLIAM J. MCSHERRY & CO., Chagrin Falls, Ohio, representative for Westcott chucks in western Pennsylvania.

JOHN F. BYROM has been appointed sales engineer in the Railway Division, Minneapolis, Minn., of the Timken Roller Bearing Co., Canton, Ohio.

ALVA L. CREMEAN, plant manager of the Bunting Brass & Bronze Co., Toledo, Ohio, manufacturer of bronze bearings and bars, has been appointed vice-president in charge of manufac-

Alva L. Cremean, vice-president in charge of manufacturing for the Bunting Brass & Bronze Co.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

For several years this space has been used to tell how Revere has collaborated with its customers, to mutual benefit. Now we want to talk about the way our customers can help us, again to mutual benefit. The subject is scrap. This is so important that a goodly number of Revere men, salesmen and others, have been assigned to urge customers to ship back to our mills the scrap generated from our mill products, such as sheet and strip, rod and bar, tube, plate, and so on. Probably few people realize it, but the copper and brass industry obtains about 30% of its metal requirements from scrap. In these days when copper is in such short supply, the importance of adequate supplies of scrap is greater than ever. We need scrap, our industry needs scrap, our country needs it promptly.

Scrap comes from many different sources, and in varying amounts. A company making screw-machine products may find that the finished parts weigh only about 50% as much as the original bar or rod. The turnings are valuable, and should be sold back to the mill. Firms who stamp parts out of strip have been materially helped in many cases by the Revere Technical Advisory Service, which delights in working out specifications as to dimensions in order to minimize the weight of trimmings; nevertheless, such manufacturing operations inevitably produce scrap. Revere needs it. Only by obtaining scrap can Revere, along with the other companies in the copper and brass business, do the utmost possible in filling orders. You see, scrap helps us help you.

In seeking copper and brass scrap we cannot appeal to the general public, nor, for that matter, to the small businesses, important though they are, which have only a few hundred pounds or so to dispose of at a time. Scrap in small amounts is taken by dealers, who perform a valuable service in collecting and sorting it, and making it available in large quantities to the mills. Revere, which ships large tonnages of mill products to important manufacturers, seeks from them in return the scrap that is generated, which runs into big figures of segregated or classified scrap, ready to be melted down and processed so that more tons of finished mill products can be provided.

So Revere, in your own interest, urges you to give some extra thought to the matter of scrap. The more you can help us in this respect, the more we can help you. When a Revere salesman calls and inquires about scrap, may we ask you to give him your cooperation? In fact, we would like to say that it would be in your own interest to give special thought at this time to all kinds of scrap. No matter what materials you buy, the chances are that some portions of them, whether trimmings or rejects, do not find their way into your finished products. Let's all see that everything that can be re-used or re-processed is turned back quickly into the appropriate channels and thus returned to our national sources of supply, for the protection of us all.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

***Executive Offices:* 230 Park Avenue, New York 17, N.Y.**

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

turing. Mr. Cremean has been with the company since 1935.

GEORGE J. SCHAD, treasurer, and ROBERT C. OVERSTREET, secretary, have been made vice-presidents of Tinnerman Products, Inc., Cleveland, Ohio.

Pennsylvania

KENNAMETAL, INC., Latrobe, Pa., announces the appointment of the following engineers and representatives: ROBERT W. HOFFMAN, Box 1081, Kansas City, Mo.; ROGER MCCRAY, 2171 Bailey Ave., Buffalo, N. Y.; DAVID MEYER, in the Indiana territory, with headquarters at the company's Cincinnati, Ohio, office; CASIMIR WYRWAS, Milwaukee, Wis.; and ROBERT ERHARD, Pittsburgh, Pa. (special die applications). These service engineers were also appointed: LEONARD ARNOLD, Milwaukee, Wis.; JULIUS MATAITIS, Philadelphia, Pa.; and MARK ROLLISON, central district.

ALFRED J. FAIRFIELD, district sales manager at Coraopolis, Pa., and sales manager in Detroit, Mich., for the Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., is retiring from his positions. He has been with the company for forty-two years. Also announced was the appointment of RICHARD D. BAKER, resident vice-president, and THOMAS TOBY, assistant manager of sales. Both men will be located at the Pittsburgh office.

GORDON R. PORTERFIELD has been promoted from the position of sales engineer in the Hydraulic Press and Power Tool Department of the Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa., to the position of assistant manager of the department. Mr. Porterfield, who was located in the New York City district office, is now at the Eddystone, Pa., office. A. F. MOORE has been appointed sales engineer in his stead, in New York.

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., announces the election of the following vice-presidents: W. W. SPROUL, in charge of the General Industrial Products Group of Divisions; L. B. MCCULLY, in charge of the East Pittsburgh Divisions; and H. E. SEIM, in charge of the Sturtevant Division.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa., announces the election of the following executives to newly created vice-presidencies: GORDON W. CAMERON, treasurer; ARTHUR P. HALL, director of public relations and advertising; and C. F. NAGEL, JR., chief metallurgist.

JAMES E. ASHMAN and L. A. DIXON, vice-presidents, have been promoted to executive vice-presidents of the Rockwell Mfg. Co., Pittsburgh, Pa. Mr. Ashman is in charge of the Power Tool and Rockwell Register Divisions of the company, while Mr. Dixon is in charge of the Material and Valve Divisions.

BIRDSBORO STEEL FOUNDRY & MACHINE CO., Birdsboro, Pa., announces the formation of a new subsidiary, BIRDSBORO ARMORCAST, INC., to make hull and turret castings for tanks. Officers of the subsidiary are: J. E. MCCAULEY, president; and MARSHALL POST and G. CLYMER BROOKE, vice-presidents.

FIRTH STERLING STEEL & CARBIDE CORPORATION, Pittsburgh, Pa., has changed its name to FIRTH STERLING, INC. The change was necessitated by company expansion to the extent that the former name was no longer descriptive of the range of products.

R. N. YATES, vice-president and general manager of the Erie Foundry Co., Erie, Pa., is resigning in June in order to engage in business for himself. Mr. Yates was with the company for the past sixteen years.

WARD A. WICKWIRE, JR., executive vice-president of Salem-Brosius, Inc., Pittsburgh, Pa., has been elected president of the company, succeeding his father, W. A. Wickwire, Sr., who recently died.

SCULLY-JONES & CO., Chicago, Ill., announces the appointment of the HOFFMAN-BAUMRUCK CO., 3134 N. Broad St., Philadelphia, Pa., as representative for Scully-Jones standard and special production tools.

KENNETH G. HUBACH was recently appointed sales manager of the Foundry and Commercial Weldment Departments of Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa.

Kenneth G. Hubach, sales manager of the Foundry and Commercial Weldment Departments of Baldwin-Lima-Hamilton

CINCINNATI MILLING MACHINE CO., Cincinnati, Ohio, announces that its Philadelphia, Pa., sales office has moved to 580 Lancaster Ave., Bryn Mawr, Pa. EBERHARDT REINIGER is manager of the newly located office.

FREDERICK C. STAKEL is joining the Aluminum Company of America, Pittsburgh, Pa., in the capacity of advertising manager. Mr. Stakel was previously associated with the Brown Co., paper manufacturer.

JAMES R. WEAVER has been appointed assistant to the vice-president in charge of manufacturing for Westinghouse Electric Corporation, Pittsburgh, Pa.

WILLIAM L. WEARLY has become general sales vice-president in charge of domestic sales for the Joy Mfg. Co., Pittsburgh, Pa.

* * *

"Pitchlign" Bearing Designed to Maintain Alignment of Rollers

The Roller Bearing Co. of America, Trenton 3, N. J., has developed a completly new type of anti-friction bearing called the "Pitchlign," which is said to combine the best features of a needle bearing, a journal bearing, and a cylindrical roller bearing, although it cannot be classified as any one of these types. "Pitchlign" bearings are claimed to have the same dimensional advantages as precision needle bearings, offer the accurate roller alignment of precision cylindrical roller bearings, and possess the ruggedness, flexibility of mounting, and easy maintenance of journal roller bearings.

The bearing is so designed that the rollers cannot become cocked or skewed. They are kept in accurate alignment by contact with the cage at their pitch line. This arrangement has been developed to reduce stress and tangential forces to a minimum. Over-all efficiency of the cage is not affected by accumulated tolerance and wear of load-carrying surfaces, since it is supported by the two integral flanges of the heavy outer race. These bearings can be mounted in any plane — horizontally or vertically — and are especially adapted for use on high-speed shafts.

* * *

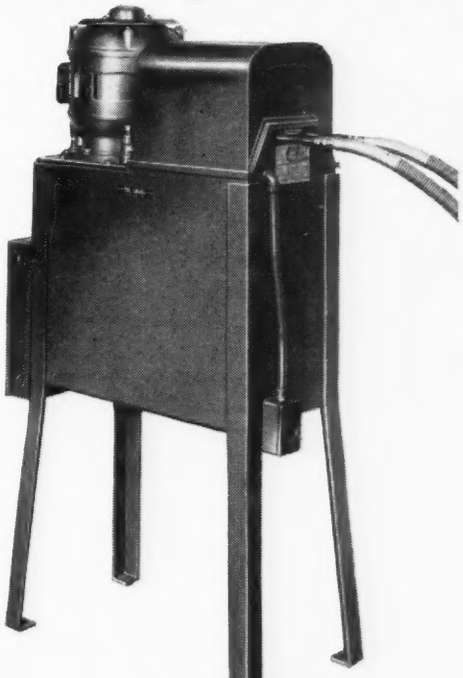
The free world's production of nickel for the full year of 1951 approximated 295,000,000 pounds — an increase of more than 10 per cent compared with 1950. Canadian producers were responsible for 275,000,000 pounds, or more than 90 per cent of the free world's total production for the year 1951.

IF YOU RIVET PUNCH FORM BEND...*Investigate* "HY-POWER" Hydraulics

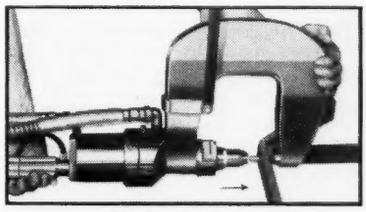
What is "Hy-Power"? The "heart" of the "Hy-Power" hydraulic system is the unique "Hy-Power" Generator—a combination of motor, pump, oil reservoir, control valves and high pressure intensifier assembled as a compact, self-contained unit—an exclusive, highly useful Hannifin development.

What will it do for you? This "Hy-Power" Generator, operating Hannifin work tools with instantly reversible push-button control, gives you "Hy-Power" Hydraulics; enables you to rivet . . . punch . . . form or bend with forces up to 100 tons (more with multiple cylinders). Everywhere, engineers are turning to this modern hydraulic power source for cost-reducing production.

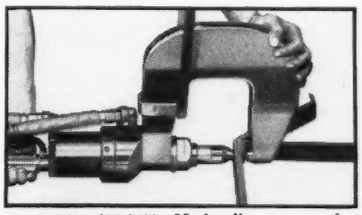
No doubt *you* can profit through Hannifin's wide experience with "Hy-Power" Hydraulics and practical recommendations for its use in your plant! Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Ill.



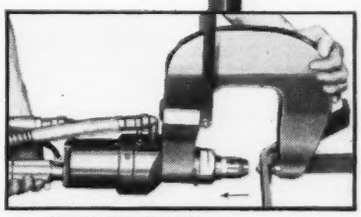
DESIGN ENGINEERS AND TOOLING SPECIALISTS...PUT THIS FINGER-TIP CONTROLLED WORK CYCLE TO WORK FOR YOU!



A. FAST APPROACH—Pressing button (finger-tip control) moves ram up to work at fast speed, using primary hydraulic pressure. *Ram returns instantly to starting position any time button is released.*



B. WORK STROKE—Hydraulic pressure is automatically intensified, and the riveting, punching, forming, bending is completed.



C. AUTOMATIC RETURN—At peak hydraulic pressure (adjustable), the ram reverses automatically; returns to starting position.

do ALL you CAN do...with

HANNIFIN

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

Coming Events

JUNE 2-4 — Annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Homestead, Hot Springs, Va. Executive secretary, John C. Sears, Empire Bldg., Pittsburgh 22, Pa.

JUNE 9-26 — Triennial meeting of the INTERNATIONAL ORGANIZATION FOR STANDARDIZATION at Columbia University, New York City. June 11-14, meeting of the Screw Threads Committee of the ISO. June 16-26, ISO Technical Committee 4 meeting, Ball and Roller Bearings. Headquarters, American Standards Association, 70 E. 45th St., New York 17, N. Y.

JUNE 16-19—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Sheraton-Gibson Hotel, Cincinnati, Ohio. Executive assistant secretary, Ernest Hartford, 29 W. 39th St., New York 18, N. Y.

JUNE 23-27 — Fiftieth anniversary meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotels Statler and New Yorker in New York City. Further information can be obtained from headquarters, 1916 Race St., Philadelphia 3, Pa.

SEPTEMBER 8-10 — THIRD NATIONAL STANDARDIZATION CONFERENCE sponsored by the American Standards Association in Chicago, Ill. Headquarters, Museum of Science and Industry. Further information can be obtained by writing to the Association at 70 E. 45th St., New York 17, N. Y.

OCTOBER 20 - 24 — NATIONAL METAL EXPOSITION AND CONGRESS at the Philadelphia Convention Hall, Philadelphia, Pa. Secretary, W. H. Eisenman, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

NOVEMBER 19—Thirty-fourth annual meeting of the AMERICAN STANDARDS ASSOCIATION at the Waldorf-Astoria in New York. Headquarters of Association, 70 E. 45th St., New York 17, N. Y.

* * *

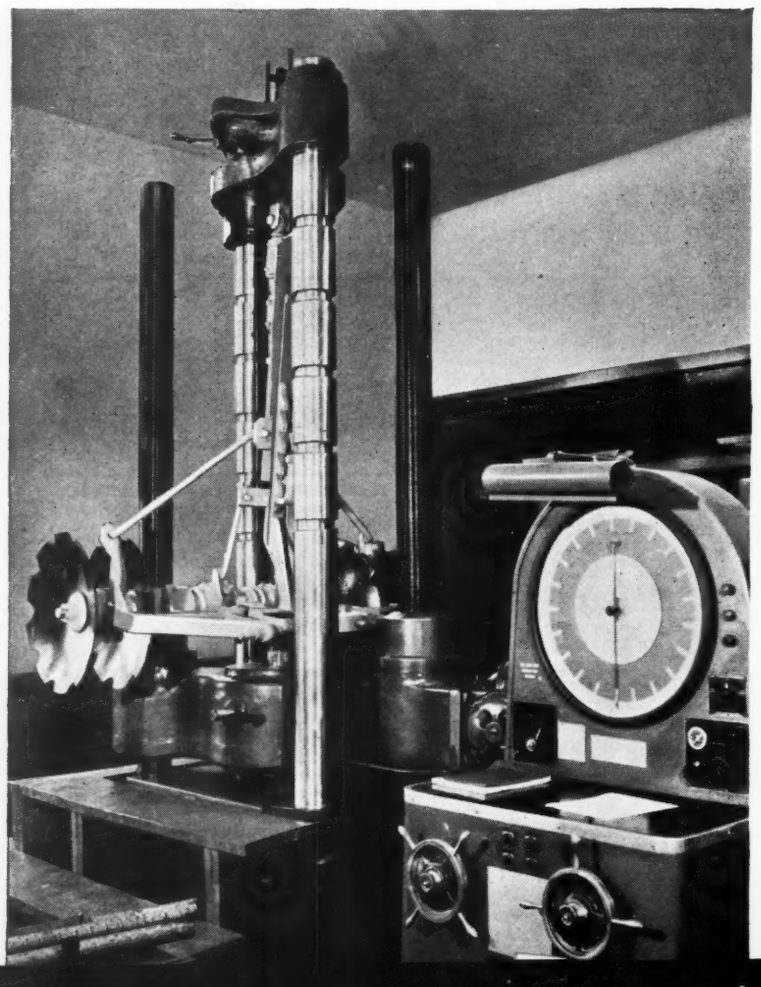
Aluminum production employs far less manpower than is needed for the production of any other metal. A recent estimate shows that all industries in the United States use, on the average, 6 kilowatt-hours of electricity for every man-hour of work. In the production of aluminum 640 kilowatt-hours of electricity are used per man-hour. The electricity required to produce one ton of aluminum would supply the average American household for a period of ten years.

Obituaries

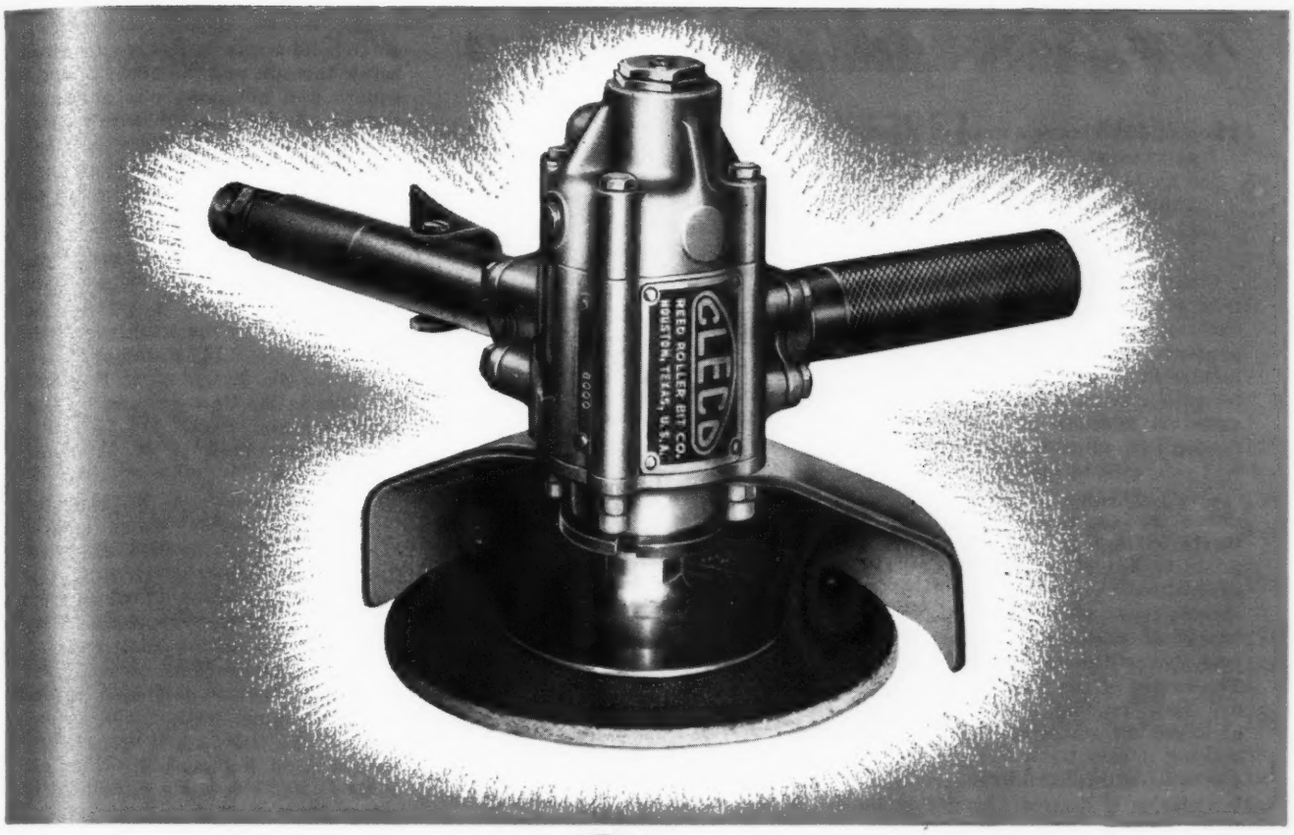
C. LAURENCE WARWICK, executive secretary of the American Society for Testing Materials, Philadelphia, Pa., died suddenly on April 23, shortly after presiding at a dinner honoring the retiring treasurer of the Society. Mr. Warwick was sixty-two years old. He had been active in the Society since 1909, at which time he was instructor, then assistant professor at the University of Pennsylvania. In 1919, he was appointed chief executive officer of the Society, and in 1946 became executive secretary. He had written a large number of technical papers and reports dealing with properties and tests of engineering materials, and especially standardization of specifications and tests. Mr. Warwick is survived by his wife, a daughter, and two sons.

JOHN A. MORRISSEY, president and founder of the Chicago Rivet & Machine Co., Bellwood, Ill., died on April 18 at his home in River Forest, Ill., at the age of fifty-eight years. As a manufacturer of rivets and riveting machines, Mr. Morrissey had a long association with the industry.

FREDERICK W. BOYÉ, JR., chairman of the board of the Boyé & Emmes Machine Tool Co., Cincinnati, Ohio, died on May 5.



Tensional test being made to determine the reaction to maximum draw-bar pull on tractor-drawn disc harrows made by the Rome Plow Co., Cedartown, Ga. The complete assembly is set up on a Baldwin testing machine in the laboratory of the Atlantic Steel Co., Atlanta, Ga. Simulating surface conditions in this manner before going into production assures the manufacturer that all parts of the assembly are of adequate strength.



How this CLECO Air Grinder saved one user $1200 in 22 minutes!

A Great Lakes ore boat came into port with a two-foot crack in the rudder. Half of the crack was under water.

The usual repair procedure involved partially lifting the boat out of the water and using a conventional grinder and chipping hammer to cut the weld groove and smooth off the weld. *This 4-hour job* would mean a loss of around $2,000 in revenue.

But this time, a Cleco 1460-A Edge Grinder was used with a 7" x ¼" flex type wheel. *Without lifting the boat from the water*, the groove was cut in the rudder, the weld was made and finished off.

The whole job was completed in 22 minutes! The owners figured they saved at least $1,200.

This is an extreme example, of course, but the Cleco 1460-A Grinder quickly pays for itself in a wide variety of applications. Get the whole story on this outstanding grinder from your Cleco field engineer.

CLECO AIR TOOLS

DALLETT

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of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.

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3439

New Books and Publications

THOMAS' REGISTER OF AMERICAN MANUFACTURERS (1952). 8100 pages, 9 by 14 inches. Published by the Thomas Publishing Co., 461 Eighth Ave., New York 1, N. Y. Price, $15 (renewal, $12.50).

Classified in the forty-second edition of this well-known purchasing encyclopedia are more than 70,000 products, covering all lines of manufacture in the United States. The information is published in three volumes, in addition to the index, or finding list, which facilitates convenient reference to the work.

The first two volumes list the names and addresses of manufacturers classified by products. The products are classified not only by generalized group names but by specific types, so that the prospective buyer can easily find the particular type that will meet his requirements. The names of the manufacturers under each product classification are arranged by states and cities, thus making it easy for a buyer to select a product within certain geographical boundaries if desired. All classifications are thoroughly cross-indexed.

The third volume contains an alphabetical list of manufacturers with branches, subsidiaries, and other data such as company officials and cable codes. It also gives an alphabetical list of trade names, together with export and other miscellaneous information.

Buyers, sales managers, research departments, production executives, and all those who require a list of products or names of manufacturers for various purposes will find this "where to buy" source an invaluable aid.

MECHANICS OF VIBRATION. By Holger M. Hansen and Paul F. Chenea. 417 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $8.00.

Vibratory motions occur to some degree in practically every structure and mechanical device known to man. Sometimes these motions are objectionable, other times desirable, but in order to produce, control, or change them, an understanding of their characteristics is necessary. Only after an investigation of the pertinent properties of the vibration can an intelligent procedure be formulated to accomplish the desired change. This book is concerned with the fundamental properties of vibratory motion.

Divided into three parts, the book deals first with systems of one degree of freedom — free vibration without damping, forced vibrations without damping, and forced vibrations with damping. The second part considers several degrees of freedom, dealing in particular with the classical method, the nobility method and use of the complex variable, and the solution of the general frequency equations. Part 3 deals with the following special topics: systems with distributed physical constants, vibration of transient character, and vibrations of a nonlinear character. The last seventy-five pages of the book consists of problems and their answers.

The book has arisen out of a course in vibration analysis offered for several years by the University of Michigan. It is intended as the first of a series of text-books in this expanding field of applied mechanics.

BASIC ENGINEERING METALLURGY. By Carl A. Keyser. 384 pages, 6 by 8 1/2 inches. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price, $8.00.

Theories, principles, and applications of engineering metallurgy are treated in this book intended to serve, primarily, students in all branches of engineering. The text also provides general metallurgical information of interest to engineers specializing in materials and methods courses.

The first six chapters present the concepts and principles of behavior common to most metals. Discussed in this connection are the mechanism of metal failure and the steps that can be taken to improve service behavior. Chapters 7-9 are devoted to the properties and heat-treatment of steel, while Chapters 10-12 present a discussion of the properties, applications, and fabrication of sone nonferrous metals. The last six chapters consider the advantages, limitations, and control of the various means of fabricating metals. Primary methods of fabrication—casting, electroforming, and powder metallurgy techniques — and secondary methods — mechanical working, joining, machining, finishing, and electroplating— are treated in this section.

BOLT, NUT, AND RIVET STANDARDS. 247 pages, 5 1/2 by 8 3/4 inches. Published by the Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, Ohio. Price, $3.00.

This revision of the so-called "Red Book" (published in 1941) has been prepared under the supervision of the Committee on Standards and Technical Practices of the Industrial Fasteners Institute. The book is intended as a service to users, acquainting them with accepted standards of nomenclature, dimensions, sizes, and other practices.

Among the new standards included in the book are those for round head bolts (carriage bolts), plow bolts, track bolts, studs, slotted and recessed screws, socket head screws, small solid rivets, large rivets, unified screw threads, and the newly adopted square and hexagon bolts and nuts unified dimensionally with Great Britain and Canada. There is a section listing weights and stock production sizes, and another listing all recognized fastener specifications.

ELECTRONIC APPLICATIONS (No. 28A in the Yellow Back Series). 58 pages, 5 1/2 by 8 1/2 inches. Published by the Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. Sold in the United States by THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y. Price, 75 cents.

Companion volume to No. 28 in the Yellow Back Series, which treated of basic electronic devices and their function in industrial circuits, this booket presents examples drawn from practice of the use of electronic devices in the machine shop and factory. The applications covered are: automatic motor speed and torque control; gaging, testing, and inspection; relays, timers, and temperature control; and induction heating, gas analysis, and electronic equipment in ropemaking.

AMERICAN STANDARD STAINLESS STEEL PIPE, ASA B36.19-1952 (Revised). 5 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, $1.00.

* * *

Compound for Setting Anchor Bolts

A cement for setting anchor bolts which are used to fasten machinery, hand-rails, seats, or equipment of any type to cement has been announced by the Hallemite Mfg. Co., Cleveland, Ohio. "Por-Rok," as it is called, replaces critical lead and sulphur for most bolt setting operations. It is mixed with water and poured into the opening around the bolt to be set. The bolt is anchored permanently in fifteen to thirty minutes. The cement is self-bonding, self-leveling, oil-resistant, and will not shrink. It is said to have a compression strength of 4500 pounds per square inch.

* * *

Uranium Deposits Report

The Department of Interior has announced publication of a report on recently discovered uranium deposits in southwestern South Dakota. Carnotite, one of the principal ores of uranium found in the Graven Canyon area north of Edgemont, S. D.